Appendix 4.15-A

Threatened and Endangered Species Agency Correspondence

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

1/8/2009

Lisa Standley
Vanasse Hangen Brustlin, Inc.
PO Box 9151
101 Walnut St
Watertown MA 02471

RE: Project Location: South Coast Rail (New Bedford/ Fall River Commuter Rail Extension)
Town: Various
NHESP Tracking No.: 98-3735

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program ("NHESP") of the MA Division of Fisheries & Wildlife for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitat* (PH) and *Estimated Habitat* (EH) as indicated in the *Massachusetts Natural Heritage Atlas* (13th Edition). Our database indicates that the following state-listed rare species have been found in the vicinity of the site:

Priority Habitat 1392 (PH 1392) and *Estimated Habitat 59* (EH59):

Scientific name	Common Name	Taxonomic Group	State Status
Ambystoma laterale	Blue-Spotted Salamander	Amphibian	Special Concern
Emydoidea blandingii	Blanding's Turtle	Reptile	Threatened
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 1392 (PH 1392):

Scientific name	Common Name	Taxonomic Group	State Status
Lycopus rubellus	Gypsywort	Plant	Endangered

Priority Habitat 1421 (PH 1421) and *Estimated Habitat 36* (EH36):

Scientific name	Common Name	Taxonomic Group	State Status
Enallagma recurvatum	Pine Barrens Bluet	Damselfly	Threatened
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern
Pseudemys rubriventris pop 1	Northern Red-Bellied Cooter	Reptile	Endangered
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 1421 (PH 1421):

Scientific name	Common Name	Taxonomic Group	State Status
Ammodramus savannarum	Grasshopper Sparrow	Bird	Threatened
Eleocharis tricostata	Three-Angled Spike-Sedge	Plant	Endangered
Sabatia kennedyana	Plymouth Gentian	Plant	Special Concern

Priority Habitat 1349 (PH 1349) and *Estimated Habitat 1* (EH 1):

Scientific name	Common Name	Taxonomic Group	State Status
Lithophane viridipallens	Pale Green Pinion Moth	Butterflies and Moths	Special Concern
Papaipema sulphurata	Water-Willow Stem Borer	Butterflies and Moths	Threatened
Synurella chamberlaini	Coastal Swamp Amphipod	Crustacean	Special Concern
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 1093 (PH 1093) and *Estimated Habitat 951* (EH 951):

Scientific name	Common Name	Taxonomic Group	State Status
Callophrys hesseli	Hessel's Hairstreak	Butterflies and Moths	Special Concern
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern
Somatochlora linearis	Mocha Emerald	Dragonfly	Special Concern
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 620 (PH 620) and *Estimated Habitat 545* (EH 545):

Scientific name	Common Name	Taxonomic Group	State Status
Ambystoma opacum	Marbled Salamander	Amphibian	Threatened

Priority Habitat 1297 (PH 1297) and *Estimated Habitat 1077* (EH 1077):

Scientific name	Common Name	Taxonomic Group	State Status
Callophrys hesseli	Hessel's Hairstreak	Butterflies and Moths	Special Concern

Priority Habitat 12 (PH 12) and *Estimated Habitat 73* (EH 73):

Scientific name	Common Name	Taxonomic Group	State Status
Emydoidea blandingii	Blanding's Turtle	Reptile	Threatened

Priority Habitat 12 (PH 12):

Scientific name	Common Name	Taxonomic Group	State Status
Scirpus longii	Long's Bulrush	Plant	Threatened

Priority Habitat 236 (PH 236) and *Estimated Habitat 121* (EH 121):

Scientific name	Common Name	Taxonomic Group	State Status
Emydoidea blandingii	Blanding's Turtle	Reptile	Threatened

Priority Habitat 1158 (PH 1158) and *Estimated Habitat 372* (EH 372):

Scientific name	Common Name	Taxonomic Group	State Status
* *Data Sensitive Species*			Endangered

Priority Habitat 1158 (PH 1158):

Scientific name	Common Name	Taxonomic Group	State Status
Panicum rigidulum ssp pubescens	Long-Leaved Panic-Grass	Plant	Threatened

Priority Habitat 298 (PH 298) and *Estimated Habitat 198* (EH 198):

Scientific name	Common Name	Taxonomic Group	State Status
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 1439 (PH 1439) and *Estimated Habitat 948* (EH 948):

Scientific name	Common Name	Taxonomic Group	State Status
Glyptemys insculpta	Wood Turtle	Reptile	Special Concern

Priority Habitat 1239 (PH 1239):

Scientific name	Common Name	Taxonomic Group	State Status
Panicum rigidulum ssp pubescens	Long-Leaved Panic-Grass	Plant	Threatened

Priority Habitat 261 (PH 261) and *Estimated Habitat 153* (EH 153):

Scientific name	Common Name	Taxonomic Group	State Status
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 229 (PH 229) and *Estimated Habitat 111* (EH 111):

Scientific name	Common Name	Taxonomic Group	State Status
* *Data Sensitive Species*			Endangered
* *Data Sensitive Species*			Endangered

Priority Habitat 454 (PH 454) and *Estimated Habitat 350* (EH 350):

Scientific name	Common Name	Taxonomic Group	State Status
Ambystoma opacum	Marbled Salamander	Amphibian	Threatened

Priority Habitat 451 (PH 451) and *Estimated Habitat 328* (EH 328):

Scientific name	Common Name	Taxonomic Group	State Status
Emydoidea blandingii	Blanding's Turtle	Reptile	Threatened

Priority Habitat 282 (PH 282) and *Estimated Habitat 179* (EH 179):

Scientific name	Common Name	Taxonomic Group	State Status
Terrapene carolina	Eastern Box Turtle	Reptile	Special Concern

Priority Habitat 924 (PH 924) and *Estimated Habitat 753* (EH 753):

Scientific name	Common Name	Taxonomic Group	State Status
Sterna hirundo	Common Tern	Bird	Special Concern
Sterna dougallii	Roseate Tern	Bird	Endangered

Priority Habitat 926 (PH 926) and *Estimated Habitat 755* (EH 755):

Scientific name	Common Name	Taxonomic Group	State Status
Sterna hirundo	Common Tern	Bird	Special Concern
Sterna dougallii	Roseate Tern	Bird	Endangered

Priority Habitat 1196 (PH 1196):

Scientific name	Common Name	Taxonomic Group	State Status
Scirpus longii	Long's Bulrush	Plant	Threatened

The species listed above are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). * These species are considered "Sensitive Species". They are highly susceptible to collection and are therefore of high concern to Natural Heritage. Information about these species (including presence/absence) can not be released to anyone (especially including release to third parties or published) unless such release is agreed to in writing by the Natural Heritage Program (See Massachusetts Public Records law: M.G.L. chapter 66 section 17D). Fact sheets for most state-listed rare species can be found on our website (www.nhesp.org).

This evaluation is based on the most recent information available in the NHESP database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Amy Coman, Endangered Species Review Assistant, at (508) 389-6364.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

JAN 12 2009

Lisa Standley
Vanasse Hangen Brustlin, INC.
101 Walnut Street
P.O. Box 9151
Watertown, Massachusetts, 02471-9151

Dear Ms. Standley,

This is in response to your letter dated December 4, 2008 regarding the Exexcutive Office of Transportation and Public Works (EOT) proposed project to provide transportation from Boston to the cities of Fall River and New Bedford, Massachusetts. Five alternatives are being proposed. One alternative would require the reconstruction of freight rail bridges across the Taunton River in Taunton. Vanhasse Hangen Brustlin, INC. (VHB) has requested information on the presence of any species listed as threatened or endangered and any species of special concern by NOAA's National Marine Fisheries Service (NMFS).

No species listed by NMFS, inclusive of shortnose sturgeon, are present in the Taunton River. Atlantic sturgeon, however, are known to be present primarily during the summer months (i.e. June) at the mouth of the Taunton River, with occasional sturgeon occurring farther upstream. Atlantic sturgeon are considered a Candidate Species as NMFS has initiated a status review for this species to determine if listing as threatened or endangered under the ESA is warranted. A status review report was completed by the status review team in February 2007. NMFS is currently reviewing the report and other available information to determine if listing under the ESA is warranted. To date, our knowledge indicates that, although the Taunton River doesn't support a spawning population of Atlantic sturgeon, the system is used as a nursery area for Atlantic surgeon (Burkett and Kynard 1993)[1]. Juvenile and sub-adult Atlantic sturgeon two years of age and older have been documented within this river system and it is believed that juveniles remain in riverine and estuarine habitats for 1-6 years (Smith 1985)[2]. Although Atlantic sturgeon are known to be present in the Taunton River, as noted above the species generally occurs at the mouth of the river and as such, it is unlikely for Atlantic sturgeon to occur in the vicinity of your proposed project. As a result, no further coordination with NMFS

Protected Resources Division on the effects of the project on listed species is necessary. Should you have any questions about these comments please contact Danielle Palmer at (978)281-9300 ext. 6518 or by e-mail (Danielle.Palmer@noaa.gov).

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

[1]Burkett, C. and B. Kynard. 1993. Sturgeons of the Taunton River and Mt. Hope Bay: Distribution, habitats and movements. Final Report for Project AFC-24-1. Massachusetts Division of Marine Fisheries, Boston, MA. 13 pp.

[2]Smith, T. I. J. 1985. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrhynchus*, in North America. Environmental Biology of Fishes 14(1): 61-72.

File Code: Sec 7 Technical Assistance 2008

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

MAY 1 3 2013

Karen K. Adams
Regulatory Division
US Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742

RE: South Coast Rail Project

Dear Ms. Adams,

The U.S. Army Corps of Engineers (USACE) is preparing to issue a Final Environmental Impact Statement for the Massachusetts' Department of Transportation's proposed South Coast Rail Project. This project would extend commuter rail service from South Station in Boston to Fall River and New Bedford. The proposed railway would cross the Taunton River in the City of Taunton, MA.

We have reviewed the proposed action and have determined that no species listed under our jurisdiction are likely to be exposed to any direct or indirect effects of the proposed project. Based on this, we do not believe a consultation in accordance with section 7 of the Endangered Species Act of 1973, as amended, is necessary. As such, NMFS Protected Resources Division does not intend to offer additional comments on this proposal. Should project plans change or new information become available that changes the basis for this determination, further coordination should be pursued. If you have any questions regarding these comments, please contact Julie Crocker of my staff (978-282-8480 or Julie.Crocker@noaa.gov).

Sincerely,

for Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

EC: Crocker, F/NER3
Boelke, F/NER4
Anacheka-nasemann, USACE

File Code: Sec 7 No Species 2013

Appendix 4.14-A

Secondary and/or Indirect Wetland Impact Assessment

SOUTH COAST RAIL

SCR SECONDARY and/or INDIRECT WETLAND IMPACT ASSESSMENT

Introduction

The Secretary's Certificate on the Draft EIR (June 29, 2011) stated that "The FEIR should expand upon the analysis of wetlands functions and values in the DEIR/S to include a more detailed analysis for the proposed Stoughton rail. The FEIR should include narrative descriptions of wetlands functions and values of each wetland impacted directly and indirectly by the proposed project. The mitigation plan should describe how the lost functions and values will be mitigated."

The EPA, in its comments on the DEIS/DEIR (May 27, 2011) stated that "The Region … is less concerned about secondary adverse impacts to adjoining wetlands and water bodies where there are existing active rail lines. In contrast, the Region is greatly concerned about secondary adverse impacts to aquatic resources along those portions of the Stoughton and Whittenton corridors where no embankment exists or where a narrow embankment has been abandoned for decades and the forest canopy now is mostly unbroken. Section 4.14 on Biodiversity, Wildlife and Vegetation, presents a thorough description and reasonable evaluation of secondary adverse impacts upon aquatic resources and wetland-dependent wildlife. Still, we believe that the evaluation is lacking adequate detail in a few areas.." Specific issues identified in the EPA letter include:

- *The FEIS should provide a more thorough and specific evaluation of the potential for adverse impacts from canopy clearing, especially across the Hockomock Swamp.*

- *Several types of environmental harm would result from the construction and operation of the Stoughton or Whittenton Alternatives. … The nature, extent, permanence, and severity of these types of secondary impacts need to be more fully evaluated in the FEIS.*

- *The Region seeks a variety of additional information about the extent, nature, and severity of direct and secondary adverse impacts to aquatic resources within the Stoughton and Whittenton rail corridors Until we have evaluated that additional information … we cannot reach conclusions regarding the significance of those adverse impacts and whether those alternatives could comply with section 230.10(c) of the section 404(b)(1) Guidelines.*

MassDOT has developed this methodology for Secondary and/or Indirect Wetland Impact Assessment in response to the requirements of the Certificate and the EPA's comments. A meeting of the Interagency Coordinating Group (ICG) wetland subgroup was held on May 4, 2012 to discuss this proposed methodology. The methodology, particularly the items in the checklist, was subsequently modified to incorporate agency comments.

Secondary and Indirect Impacts

Secondary (indirect) effects are defined in the EPA Regulations at 40 CFR Part 230.11. The EPA regulations state that "Secondary effects are effects on an aquatic ecosystem that are associated iwth a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material . "

Although not specifically addressing impacts to aquatic resources, the CEQ NEPA regulations at 40 CFR Part 1508.8 define indirect effects as ".. effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably forseeable. Indifect effects many include … related effects on air and water and other natural systems, including ecosystems". Although the

MEPA Regulations (314 CMR 11.00) require that an EIR assess potential indirect impacts on the environment, the regulations do not provide a definition.

Indirect impacts are therefore the consequences of an action's direct impacts. While the direct impact of filling a wetland would be the loss of the filled wetland area and the functions and values provided by that specific area, the indirect impacts of that wetland fill would result from the associated changes to the overall size of the wetland, hydrology, cover type, species assemblage, or degree of habitat fragmentation. These types of impacts could adversely affect the ability of the wetland to provide functions and values, or could diminish the functions and values to a degree greater than would be attributed simply due to the loss of area. Isolated fragments of wetlands or waterways may have reduced habitat value, no longer provide viable fish or wildlife habitat or be so isolated that the wetland or waterway fragments are rendered inaccessible to many fish or other aquatic species.

Section 404 jurisdiction over the South Coast Rail project is triggered by the direct discharge of fill material to waters of the United States (vegetated wetlands and water bodies). However, the Corps must consider the probable impacts, including cumulative impacts, of the proposed activity and its intended use, on the public interest. As stated in 33 CFR Section 320.4, permits can only be issued by the Corps if the discharge complies with the Environmental Protection Agency's 404(b)(1) Guidelines. The criteria for evaluating adverse effects (40 CFR 230.10(c), and further elaborated in Subpart D, Section 230.32)) under these guidelines include:

- Significant adverse impacts on …wildlife and special aquatic sites;
- Significant adverse effects on aquatic life and other wildlife dependent on aquatic ecosystems outside of the disposal site ;
- Significant adverse effects of the discharge on aquatic ecosystem diversity, productivity and stability.

For this analysis, indirect (secondary) impacts to wetlands and other waters of the United States include the following effects which could be caused by the placement of fill within jurisdictional wetlands, but occur at a different location or time:

- Changes in wetland functions; or
- Changes in wetland physical/biological characteristics as a result of the direct impacts (loss of wetland).

The types of direct impacts and the indirect impacts that may result include:

- Filling a portion of a wetland (loss of) – reduction in wetland size, Introducing human activity (noise, disturbance);
- Dredging a wetland/pond – change in hydrology, vegetation, habitat;
- Constructing a berm across a wetland – change in hydrology, fragmentation, introduction of disturbed non-wetland conditions, creation of new "edge", interrupt migratory routes;
- Installing a new culvert or changing existing culvert – alter water levels or flow patterns;
- Removing canopy or other vegetation – change light regimes, water temperature, plan community structure;

- Relocating a stream – change flow characteristics; or
- A new discharge of stormwater - alter water levels or flow patterns, or introduce sediments or nutrients.

In addition, the Massachusetts Wetlands Protection Act regulates work within 100 feet of a bordering vegetated wetland based on the presumption that work in close proximity to a wetland may alter the wetland such that its ability to protect the eight Interests of the Act are adversely affected. The Interests of the Act include the protection of public or private water supply, ground water supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish, protection of fisheries, and protection of wildlife habitat. "Alter" is defined in the WPA regulations at 310 CMR 10.04 as

> "to change the condition of any Area Subject to Protection under MGL c. 131, section 40. Examples of alterations include, but are not limited to, the following:
>
> (a) The changing of pre-existing drainage characteristics, flushing characteristics, salinity distribution, sedimentation pattners, flow patterns, and flood retention areas;
>
> (b) The lowering of the water level or water table;
>
> (c) The destruction of vegetation;
>
> (d) The changing of water temperatures, biochemical oxygen demand, and other physical, biological or chemical characteristics of the receiving water."

Geographic Limits of the Analysis

At the meeting, several agency representatives asked that the impact analysis look at wetlands that were more than 100 feet from the right-of-way, and cited studies associated with the Vermont Circumferential Highway that required analysis of the secondary and/or indirect effects of a highway at least 300 feet from the roadway. Subsequent to that meeting, the MassDOT team reviewed the available literature to determine an appropriate geographic limit for the evaluation of secondary and/or indirect impacts to aquatic resources.

There are numerous published studies that document that road construction may adversely affect the hydrology of wetlands upstream and downstream of a new road, and may adversely affect the movement of nutrients, sediment, or wildlife between wetlands (see Biglin, K. and A. Dupigny-Giroux, 2006; Fahrig, L. and T. Rytwinski, 2009; Forman, R.T. and R. D. Deblinger, 2000; Forman, R.T., D. Sperling, J.A. Bissonette, A. P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, T. C. Winter, 2003; Trombulak, S. C. and C. A. Frissell. 2000; and references cited therein). For newly constructed roads, these effects have been documented to extend 200 to 300 meters from the road. Other studies have focused on the effects of roads, particularly highways, on wetland-dependent wildlife (Eigenbrod et. A. 2009; Forman et al., 2003) and have shown that roads have adverse effects on aquatic wildlife populations as a result of loss of habitat (directly or because roads prevent access to habitat) or as a result of noise, particularly for multi-lane major highways. Forman and Deblinger (2000) coined the phrase "Road-Effect Zone" for the combined area of highway-related secondary and/or indirect effects to natural ecosystems, and considered (based on research by others) that 300 meters was the maximum distance that ecological effects would occur from a highway. Subsequent studies have shown that highway effects are highly

species-specific (Eigenbrod et al.. 2009) and are correlated with the width of the highway, the volume of traffic, and the night/day traffic distribution.

As discussed in the Biodiversity Technical Report, there are few if any studies of the effects of railroads on wildlife, and we were unable to find any published studies of the effects of railroads on aquatic ecosystems. The South Coast Rail project is not comparable to any of the studies of road effects. The entire project uses a railroad bed that was constructed across wetlands in the 1880s. While the effects of new construction of a railroad through wetlands would be comparable to the new construction of a road or highway across wetlands, any hydrological effects on wetlands occurred following construction and have been stable for a century. The replacement of existing culverts, designed according to modern careful standards for stream crossings, will not require any stream channelization and will maintain existing hydrology. Connectivity between wetlands, particularly for fish and small vertebrates that use culverts, would improve.

Railroads do not generate the severe, constant noise levels that are characteristic of a highway. As documented in the Biodiversity Technical Report, on the Southern Triangle (New Bedford Main Line and Fall River Secondary), any given point will experience 20 train pass-bys per day, for an average of 6 seconds per pass. The number of train pass-bys would be 40 per day between Stoughton and Myricks Junction.

On the basis of this review of the literature and a solid understanding of the construction and operations of the South Coast Rail corridor, in comparison to the road-effects of new road construction or the road-effects of an operating highway, we conclude that there is no scientific basis for considering the South Coast Rail's "road-effect zone" for impacts to aquatic resources to extend further than 100 feet from the right-of-way. The sole exception to this conclusion would be restricted to the out-of-service section of the Stoughton Line where there are currently no barriers to the movement of small aquatic vertebrates (vernal pool amphibians, frogs, and turtles) across the railroad embankment. Reconstructing the railroad would introduce a barrier to the movement of such vertebrates and would reduce the area of available habitat, as discussed in the *Biodiversity Technical Report*. The "railroad-effect zone" for such wetland-dependent species could extend to 750 feet from the ROW. These impacts are documented in the *Biodiversity Technical Report*.

Methodology

Indirect (and/or Secondary) impacts to wetlands will be assessed for each within 100 feet of the Stoughton Line between Brock Street in Stoughton and the terminal stations in New Bedford and Fall River, and along the Whittenton Branch from Route 138 in Raynham to the Attleboro Secondary in Taunton, based on the functions and values that the wetland provides and the type and extent of the direct wetland impact and/or work adjacent to the wetland that is the cause of the secondary impact. This is a stepwise process that includes:

- For each wetland, identify the type of direct impact:
  - Loss of wetland area due to placement of fill
  - New culvert
  - Replacement of existing culvert
  - Other
  - Direct discharge of untreated stormwater from a pollutant source

- For each wetland, identify the type of work occurring within 100 feet of the wetland:
  - Improvement of existing freight or commuter rail tracks and increased train service
  - Replacement of track infrastructure on out-of-service rail and addition of train service
- Evaluate secondary and/or indirect impacts based on function-specific considerations using the attached checklist, and
- Provide a summary paragraph for each wetland.

The list of potential effects on functions and values is based on the "considerations and qualifiers" for each wetland function and value, as presented in the Corps of Engineers' "*Highway Methodology Workbook Supplement – Wetland Functions and Values, a Descriptive Approach*" (September 1999). These characteristics are identified in the *Supplement* as the principal characteristics which contribute to the ability of each wetland to provide the indicated function or value. If the direct wetland impact of the proposed action altered these characteristics, it is presumed to alter the ability of the wetland to continue to provide these functions.

REFERENCES CITED

Biglin, K. and A. Dupigny-Giroux. 2006. Mapping the road-effect zone to assess impacts of proposed road segments. Journal of Conservation Planning 2:1-16.

Eigenbrod, F., S.J. Hecnor, and L. Fahrig. 2009. Quantifying the road-effect zone: threshold effects of a motorway on anuran populations in Ontario, Canada. Ecology and Society 14:24. http://www.ecologyandsociety.org/vol14/iss1/art24

Fahrig, L. and T. Rytwinski. 2009. Effects of roads on animal abundance: an empirical review and synthesis. Ecology and Society 14: 21. http://www.ecologyandsociety.org/vol14/iss1/art21

Forman, R.T. and R. D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. Conservation Biology 14:36-46.

Forman, R.T., D. Sperling, J.A. Bissonette, A. P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, T. C. Winter. 2003. Road Ecology: Science and Solutions. Island Press. 481 pp.

Trombulak, S. C. and C. A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18-30.

SOUTH COAST RAIL

SCR WETLAND INDIRECT IMPACTS CHECKLIST

Indirect Impacts to Massachusetts Wetlands – does the work in the buffer zone or direct wetland impact alter the wetland by:

- Changing drainage characteristics or flow patterns
- Changing water levels
- Altering vegetation (outside of the direct impact area)
- Changing the temperature or biochemical characteristics of a stream or other waterbody

Groundwater Recharge/Discharge – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Result in the loss of gravel or sandy soils present in or adjacent to the wetland
- Eliminate or reduce the association of the wetland with a perennial or intermittent watercourse
- Eliminate the defined or constricted outlet of the wetland
- Change the volume of water reaching the wetland via infiltration or surface runoff
- Reduce water quality within the wetland

Floodflow Alteration – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the hydric soils which are able to absorb and detain water
- Change the constricted outlet (ability of the wetland to pond water)
- Change the ability of the wetland to receive floodflow from surrounding uplands
- Change the sinuosity of the watercourse within the wetland
- Change the density or type of vegetation within the wetland

Fish and Shellfish Habitat – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the size of the wetland that is capable of supporting fish
- Change the connectivity of the wetland with the larger contiguous watercourse
- Reduce stream width to less than 50 feet
- Reduce water quality to a level that would not support fish
- Eliminate shading streamside vegetation

- Eliminate spawning areas (submerged vegetation or gravel beds)
- Introduce new barriers to fish (esp. anadromous /catadromous fish) movement
- Change water velocities so that they are excessive for fish
- Alter sediment load or change turbidity

Sediment/Toxicant/Pathogen Retention – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the opportunity for sediment trapping by slowly moving water or deepwater habitats
- Reduce the duration of water retention in the wetland
- Result in the construction of drainage ditches within the wetland
- Increase water velocity within the wetland
- Reduce the degree of water and vegetation interspersion within the wetland
- Reduce the density or type of wetland vegetation that can trap or retain sediments
- Increase the input of sediment or toxicants to the wetland

Nutrient Removal/Retention/Transformation – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the potential for sediment trapping
- Reduce the seasonal duration of wetland saturation/water ponding
- Reduce the density or type of wetland vegetation, especially emergent vegetation
- Decrease the retention time of water in the wetland
- Increase water velocity within the wetland
- Increase the discharge of nutrients to the wetland

Production Export – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the wildlife food sources that grow within the wetland
- Reduce detritus development
- Reduce wildlife usage of the wetland
- Reduce fish usage of the wetland

- Reduce vegetation density
- Reduce the diversity of wetland plant species or the degree of plant community structure
- Alter the wetland outlet so that production export is reduced

Sediment/Shoreline Stabilization – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Alter the existing bank and root mass
- Reduce the width of the wetland adjacent to the watercourse to less than 10 feet
- Increase flow velocity in the watercourse
- Reduce the density of wetland or aquatic vegetation on the bank
- Eliminate trees or woody shrubs on the bank that provide stabilization

Wildlife Habitat – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce water quality below Class A or B standards
- Fragment the wetland
- Create a barrier between other wetland systems
- Create a barrier to wildlife movement between the wetland and uplands
- Reduce the availability of wildlife food sources
- Reduce the degree of interspersion of vegetation classes/communities
- Change the dominant wetland class
- Reduce wetland vegetation density
- Reduce wetland plant diversity
- Reduce the abundance or diversity of insects
- Substantially reduce the IEI value as determined using CAPS
- Create extensive disturbance likely to introduce invasive plants
- Change hydrology of the wetland such that plant communities or habitats would be expected to change
- Introduce a new noise source with the potential to affect adjacent areas

- Create a canopy gap that could affect microclimate
- Fill a vernal pool
- Fill vernal pool habitat
- Result in the loss of vernal pool upland habitat

Recreation – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Eliminate or reduce public access for fishing or hunting (where permitted)
- Eliminate or reduce access for hiking within the wetland
- Result in the discharge of pollutants to a waterbody or watercourse
- Adversely affect the visual/aesthetic quality of a recreational site
- Affect the ability of the wetland to function as a recreational site

Educational/Scientific Value – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Introduce disturbance to an undisturbed educational site
- Affect access to an educational site
- Affect use for scientific or educational purposes (current use)
- Adversely affect the visual quality of an educational site

Uniqueness/Heritage – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Affect the unique characteristics of the wetland (loss of a wetland class, loss of deep or shallow marsh), especially if a unique plant community is present
- Eliminate historic buildings or dams within the wetland
- Adversely affect an important archaeological site
- Adversely affect a wild and scenic river

Visual Quality/Aesthetics – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Reduce the diversity of wetland classes visible from primary (public) viewing locations
- Eliminate wetland vegetation that provides fall color or masses of blooms
- Introduce signs of disturbance visible from primary viewing locations

- Introduce high noise level at primary viewing locations
- Obstruct sight lines through wetlands

Endangered Species Habitat – does the direct impact to an aquatic resource, or work in uplands immediately adjacent to the wetland:

- Adversely affects critical habitat for a state or federally listed T&E Species within the wetland
- Affect migration of T&E species within a wetland, or between wetland and upland habitats
- Reduce water quality
- Affect the supply of food resources for T&E species using the wetland

Appendix 4.14-B

Potential Land Preservation Areas

SOUTH COAST RAIL

Potential Land Preservation Areas

PPA #	Site Name	Municipality	Size (ac)	Has Priority Habitat	Has Vernal Pools	Notes
P09	Gobi Property	Foxborough, Sharon	191	N	Y	
P14	Municipal Water Source and Future Well Site	Foxborough	77	PH 488 / EH 392	Y	
P17	Canoe River ACEC (MAPC Region)	Foxborough	11	N	N	No wetlands – developable uplands adjacent to Willow St.
P20	Massapoag Sportmen's Club	Sharon	125	N	Y	
P22	Sreda Property	Sharon	88	PH 298 / EH 198	Y	Includes land to north and west of original delineated parcel[1]
P24	Morse Farm	Sharon	40	PH 367 / EH 233	N	
P25	Rattlesnake Hill	Sharon	339	PH 367 / EH 233	Y	
P26	Echo Pond	Stoughton	60	N	Y	
P28	Benson Pond	Stoughton	102	N	Y	
P33	Clover Valley Farm	Easton	94	N	N	Includes additional land outside of original delineated parcel[1]
P34A	Hockomock ACEC (OCPC Region)	Easton	315	PH 1392 / EH 59	Y	Large cranberry bogs
P34B	Hockomock ACEC (OCPC Region)	Easton	131	PH 245 / EH 132	Y	
P34C	Hockomock ACEC (OCPC Region)	Bridgewater	224	PH 1392 / EH 59	Y	Large cluster of vernal pools
P36	Taunton River/South Bridgewater/Cumberland Farm Land	Bridgewater	746	PH 1423 / EH 34	Y	Restoration of ditched farm fields
P37	Taunton River	Bridgewater	151	PH 1423 / EH 34	Y	Includes additional land to east of original delineated parcel[1]
P38	Bird Street Sanctuary	Stoughton	45	N	Y	Small portions of developable upland accessible
P40	Southworth Pond and Lipsky Fields	Stoughton	59	N	N	
P46A	Upper Taunton River	Middleborough	228	PH 1421 / EH 36	Y	
P46B	Upper Taunton River	Raynham	393	PH 282 / EH 179	Y	
P47	Great & Little Cedar Swamps	Halifax,Middleborough	2,579	PH 1332 / EH 966	Y	High priority, includes extensive farm areas
P49	Nemasket River - Farm Protection	Middleborough	186	PH 13 / EH 77	Y	Protection of wetlands in northern portion

Appendix A Potential Land Preservation Areas (continued)

PPA #	Site Name	Municipality	Size (ac)	Has Priority Habitat	Has Vernal Pools	Notes
P50A	Green Heart Corridor	Middleborough	997	N	Y	Cranberry bogs
P50B	Green Heart Corridor	Middleborough	523	PH 226 / EH 107	Y	
P51	Thatcher Pond	Taunton	180	PH 1421 / EH 36	Y	
P52	Runnins River Headwaters	Seekonk	292	PH 724 / EH 661	Y	
P53	Palmer River Aquifer/Zone II Protection Area	Rehoboth	198	N	Y	
P54	Muddy Cove Brook	Dighton	207	N	Y	
P55	Lower Taunton River Protection Area	Berkley	50	N	Y	Area adjacent to existing protected open space
P56	Acidic Fen	Freetown	255	PH 1379	Y	
P58	Greenway Connection	Freetown	1,583	PH 303 / EH 204, PH 1239 / EH 177	Y	Surrounds small box of existing protected open space
P59	Mattapoisett River Aquifer Protection Area	Rochester	1,138	PH 1330 / EH 58	Y	
P60	Aucoot Cove	Marion	49	PH 15 / EH 79	N	Frontage to existing road
P61	Pine Barrens/Aquifer Protection Area	Wareham	1,341	PH 1396 / EH 862 / EH 969. PH 858, PH 859	Y	Developable uplands in central section of parcel
P62	Bioreserve (Infill)	Westport	275	N	Y	
P63A	Acushnet Swamp	Dartmouth	176	PH 1349 / EH 1	Y	
P63B	Acushnet Swamp	Dartmouth	196	PH 1349 / EH 1	N	
P66	Aponagansett Cove	Dartmouth	189	PH 922 / EH 751	Y	
P69	Nasketucket Bay State Reservation Area	Mattapoisett, Fairhaven	185	PH 15 / EH 79	N	

Source: Vanasse Hangen Brustlin, Inc., 2012

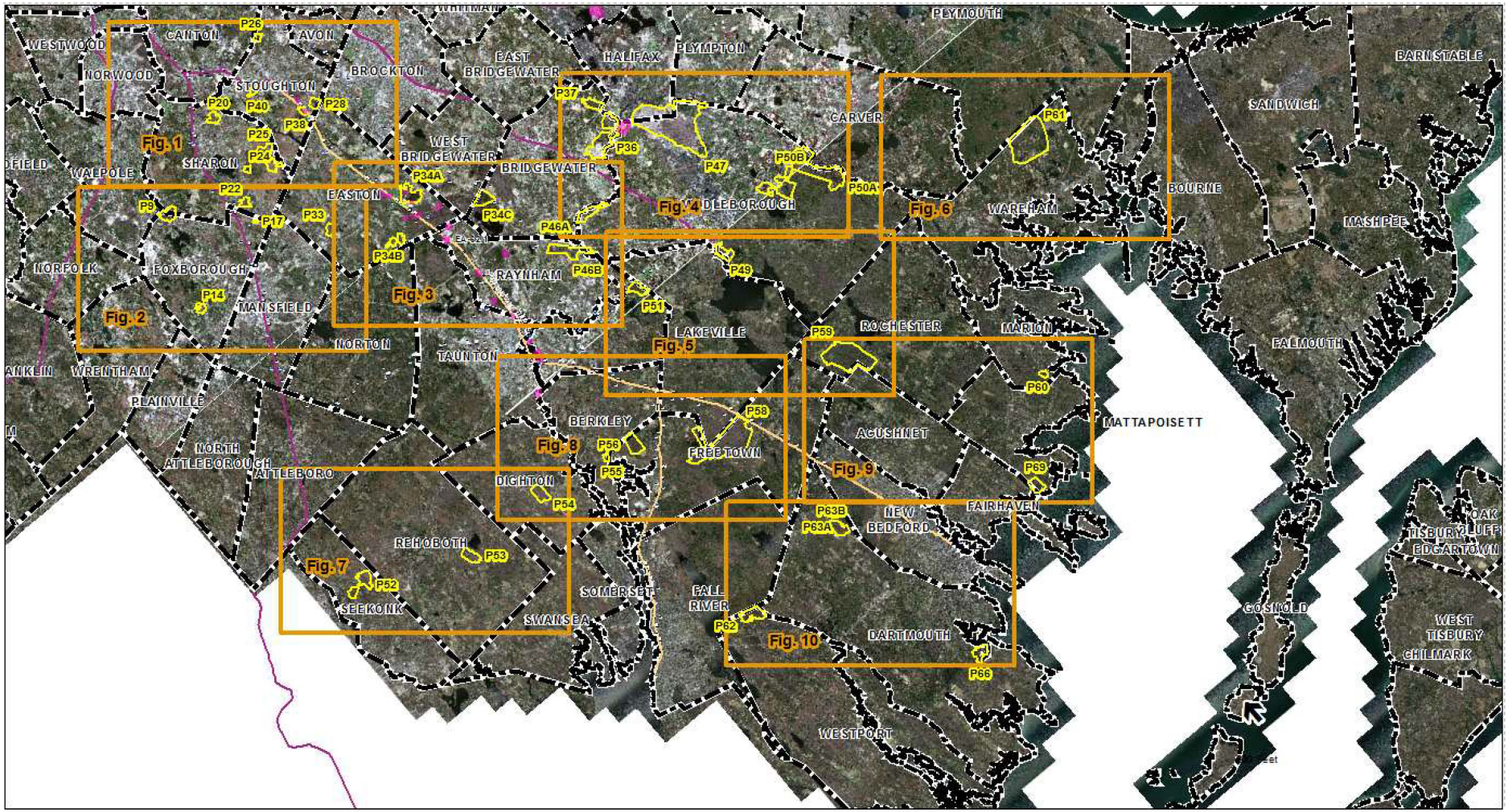
[1] "Original delineated parcel" refers to parcels as shown on the Corridor Plan map.

SOUTH COAST RAIL

Figure Key

Symbol	Description
	Open Water
	Bog
	Cranberry Bog
	Deep Marsh
	Shallow Marsh Meadow or Fen
	Shrub Swamp
	Wooded Swamp Coniferous
	Wooded Swamp Deciduous
	Wooded Swamp Mixed Trees
	South Coast Rail Alignment
	MBTA Commuter Rail
	Protected Open Space
	NHESP Priority Habitat
	Potential Mitigation/Establishment/Restoration Area

Scales are noted in each figure.



Overview of protection opportunities in PPAs. Scale = 1:250,000.

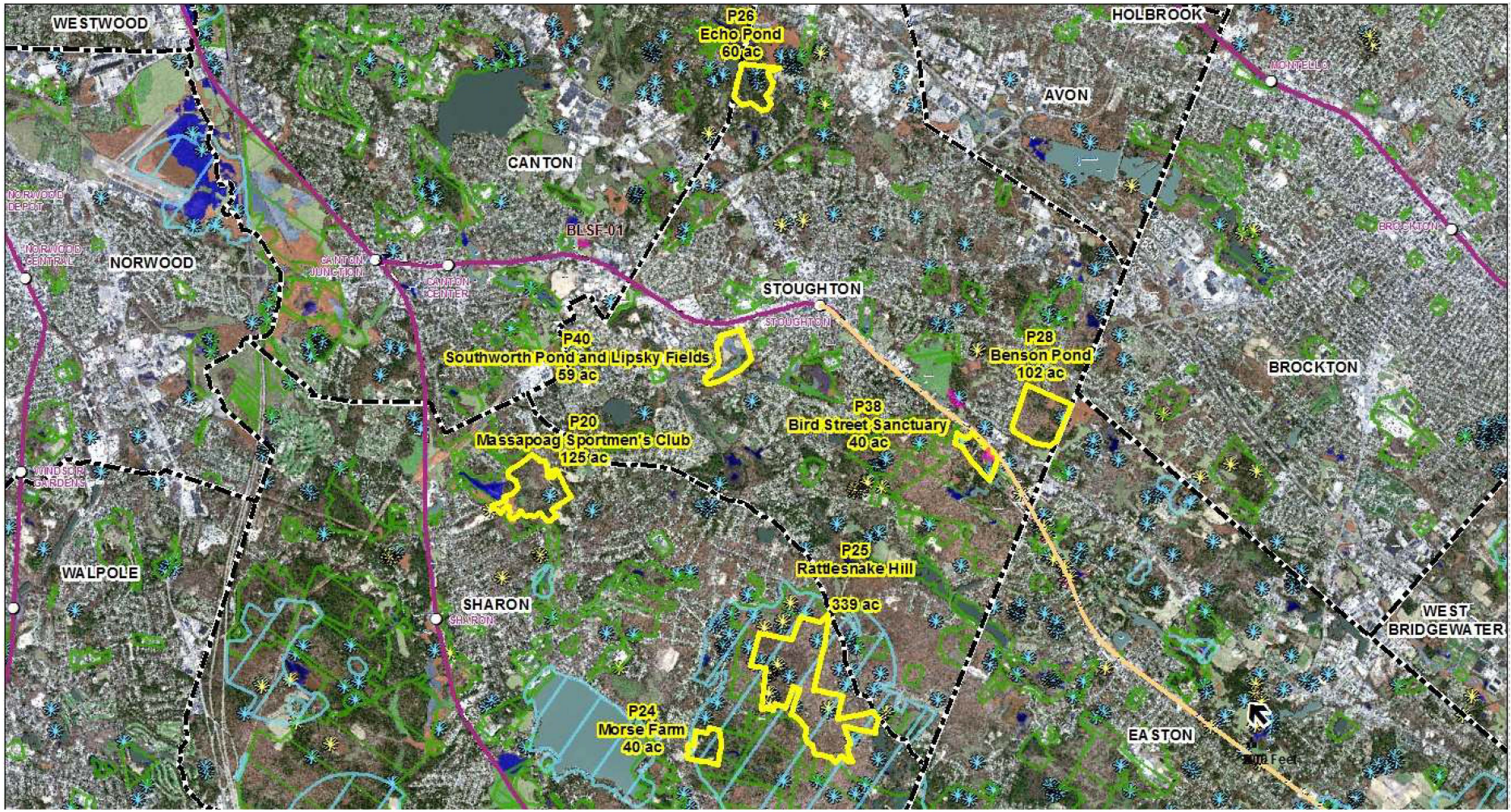


Figure 1. Protection opportunities in Stoughton and northern/eastern Sharon. Scale = 1:50,000.

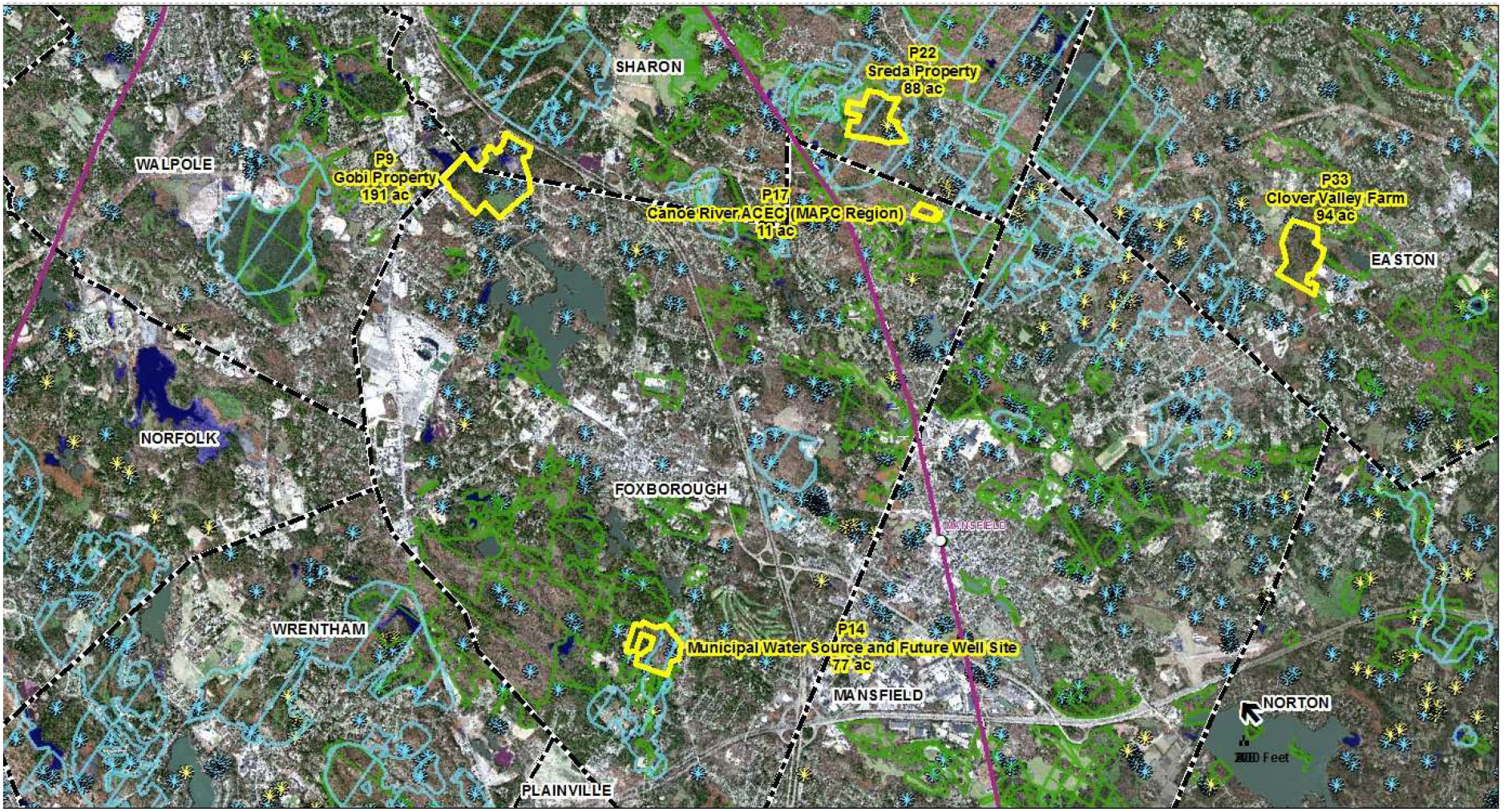


Figure 2. Protection opportunities in southern/western Sharon, Foxborough, and western Easton. Scale = 1:50,000.

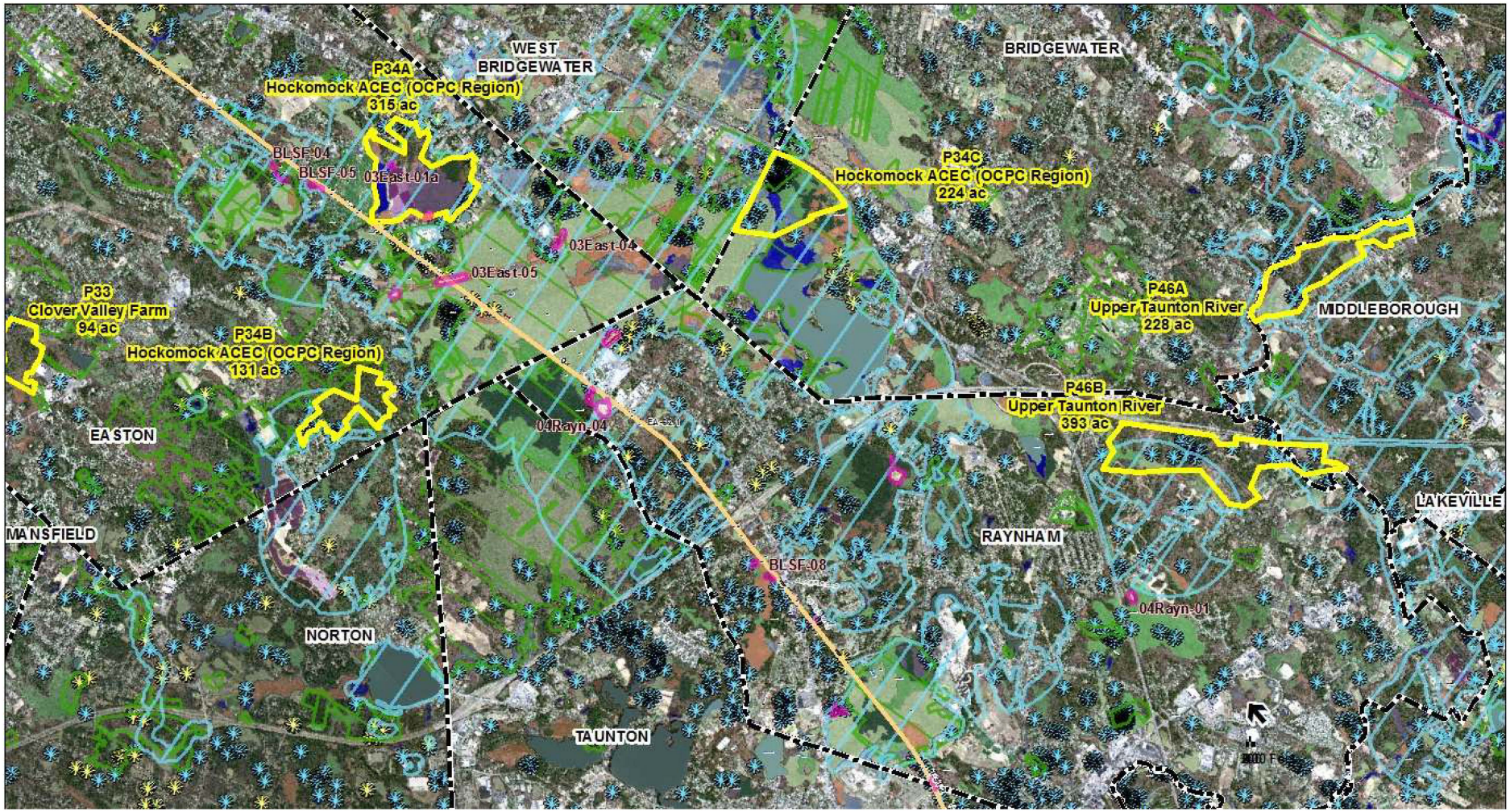


Figure 3. Protection opportunities in eastern/southern Easton, western Bridgewater, northwestern Middleborough, and Raynham. Scale = 1:50,000.

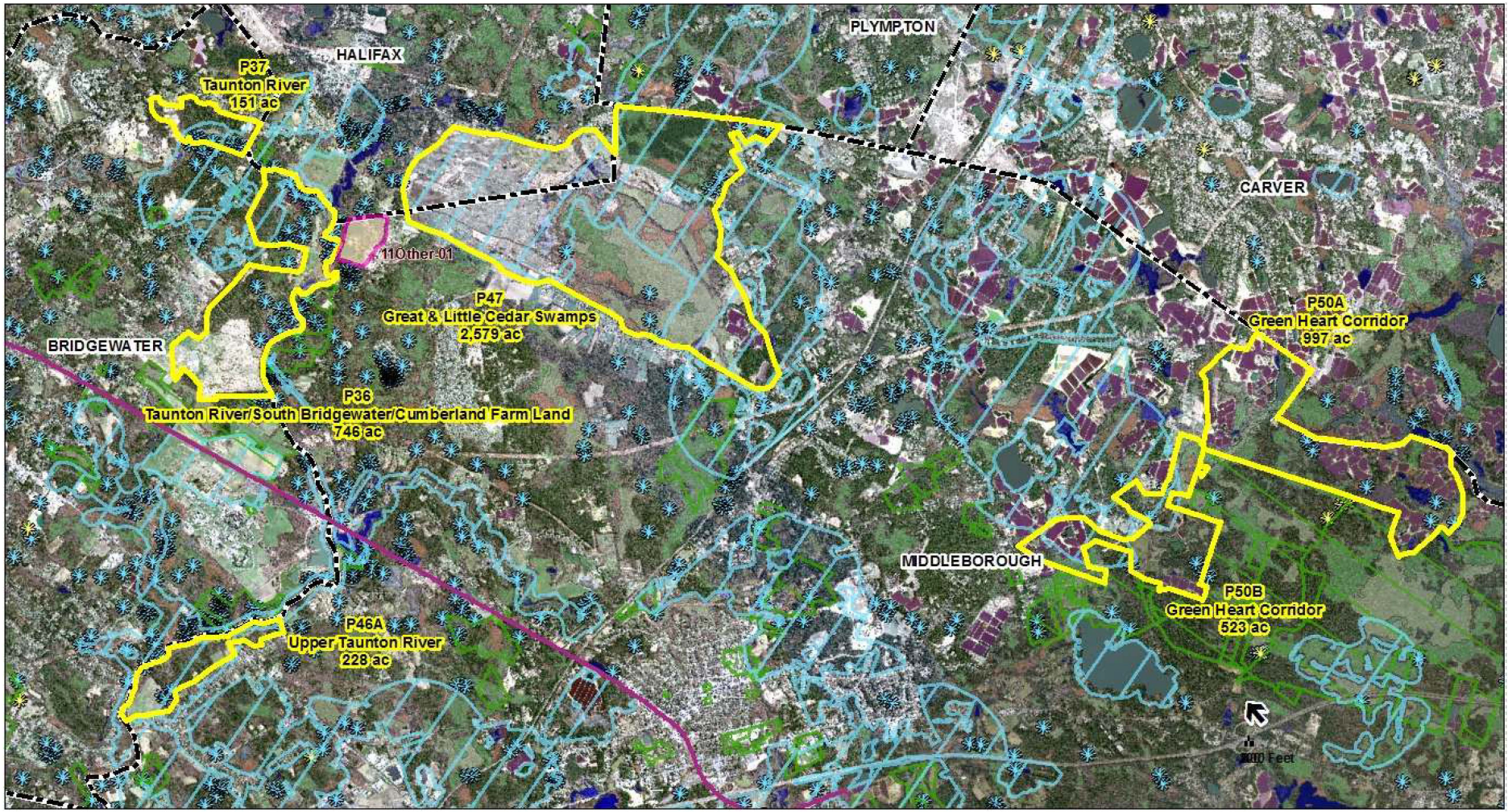


Figure 4. Protection opportunities in eastern Bridgewater, Halifax, and eastern/southern Middleborough. Scale = 1:50,000.

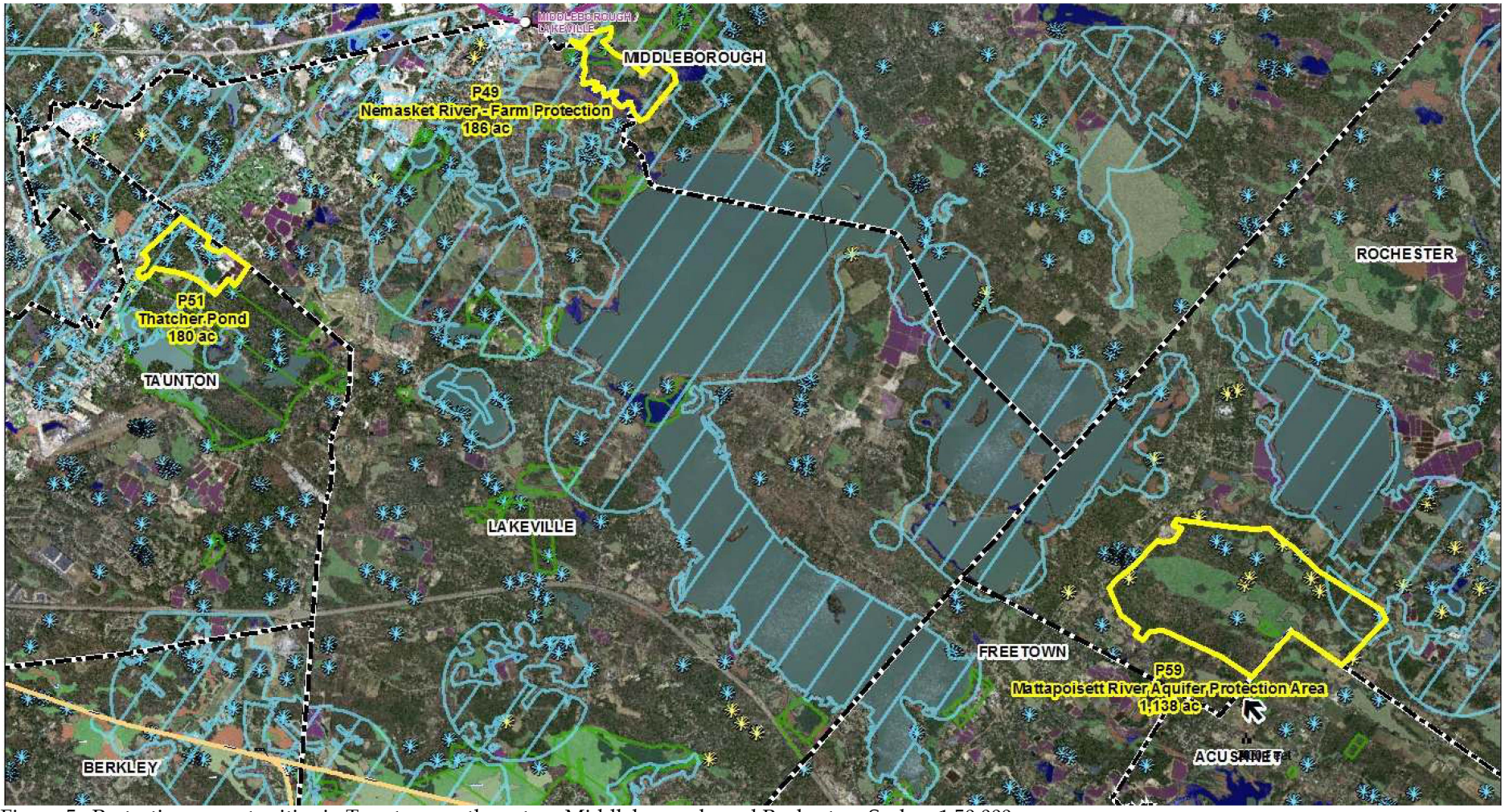


Figure 5. Protection opportunities in Taunton, southwestern Middleborough, and Rochester. Scale = 1:50,000.

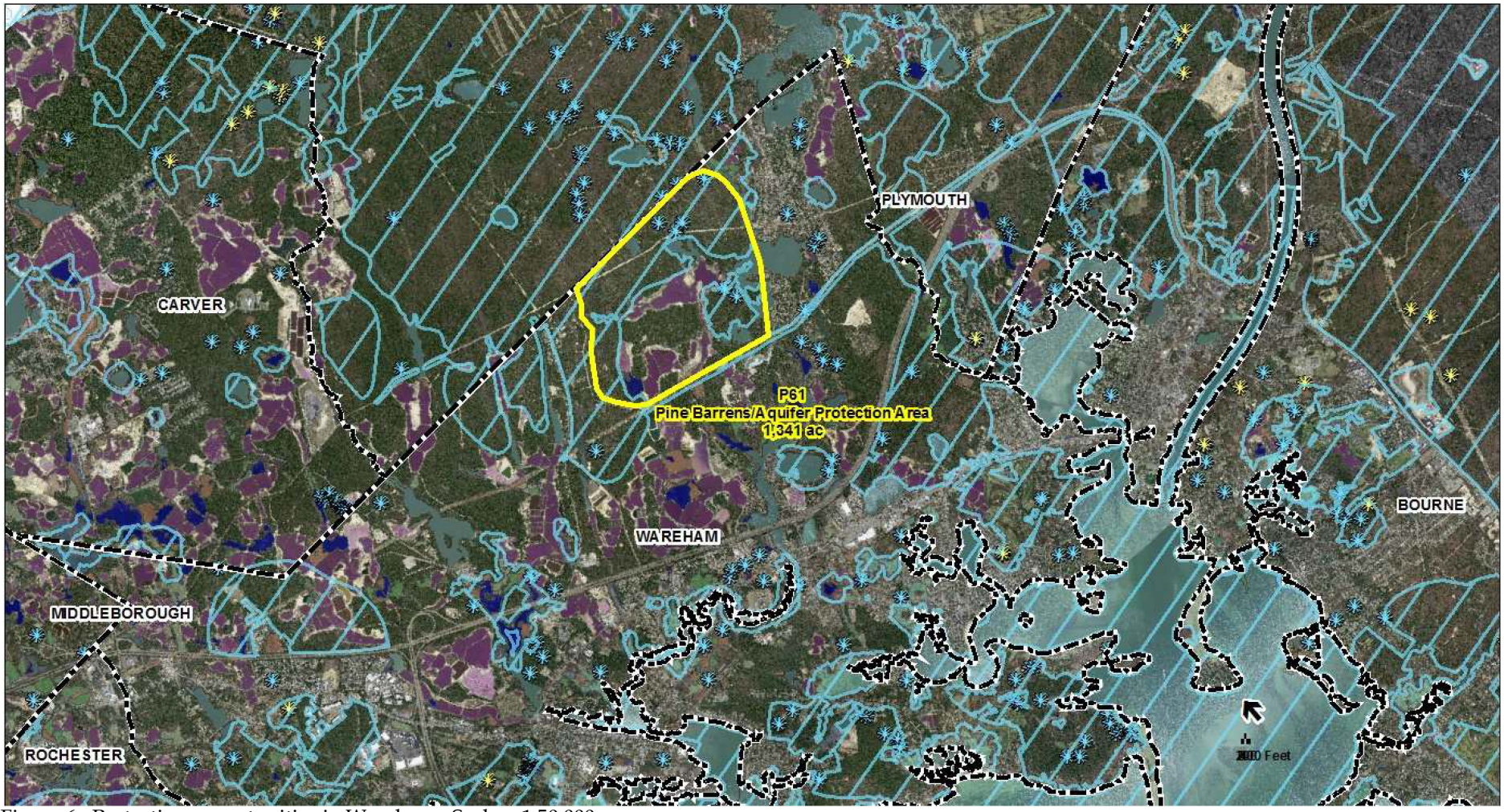


Figure 6. Protection opportunities in Wareham. Scale = 1:50,000.

Figure 7. Protection opportunities in Seekonk, Rehoboth, and Dighton. Scale = 1:50,000.

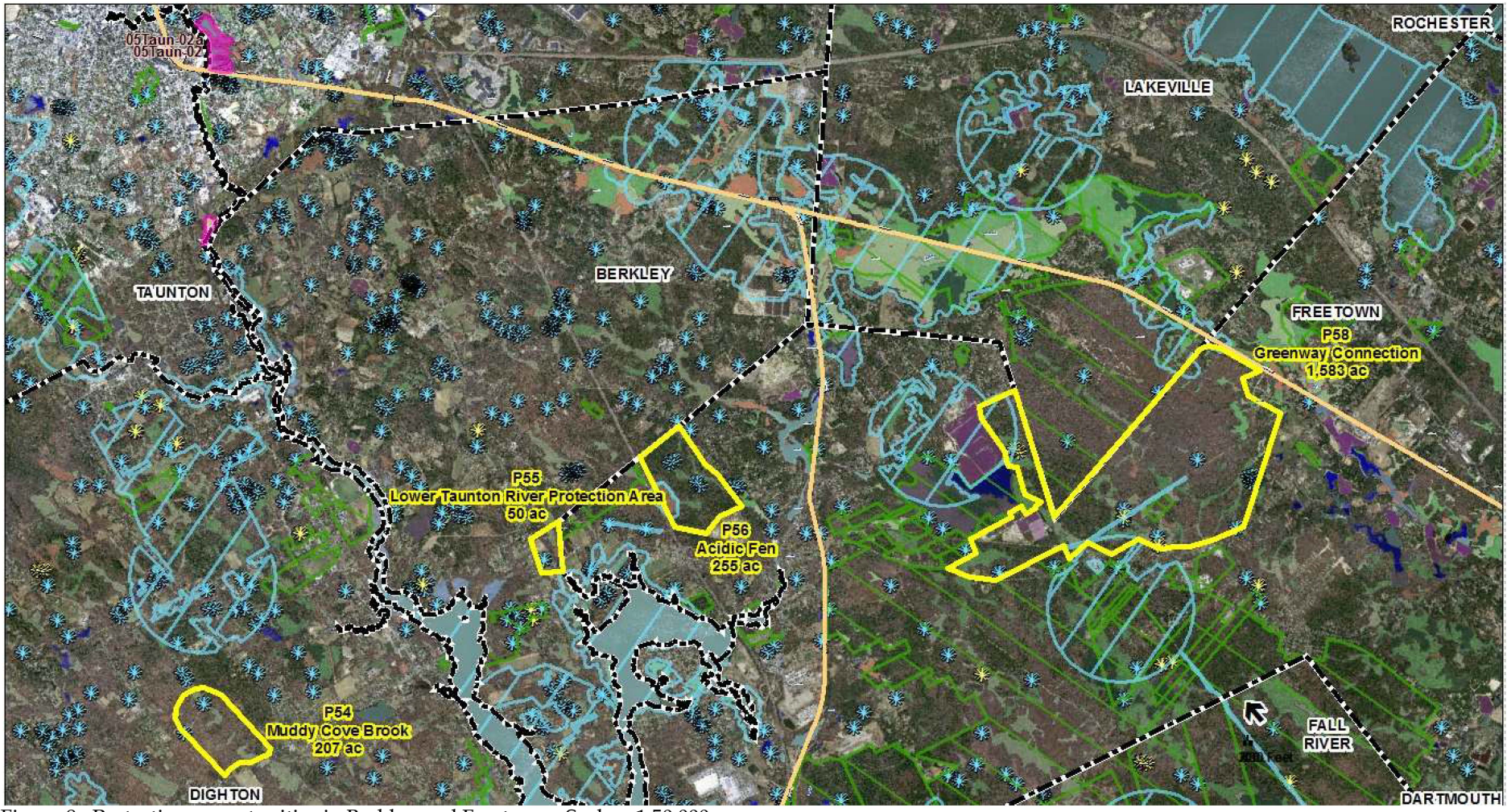


Figure 8. Protection opportunities in Berkley and Freetown. Scale = 1:50,000.

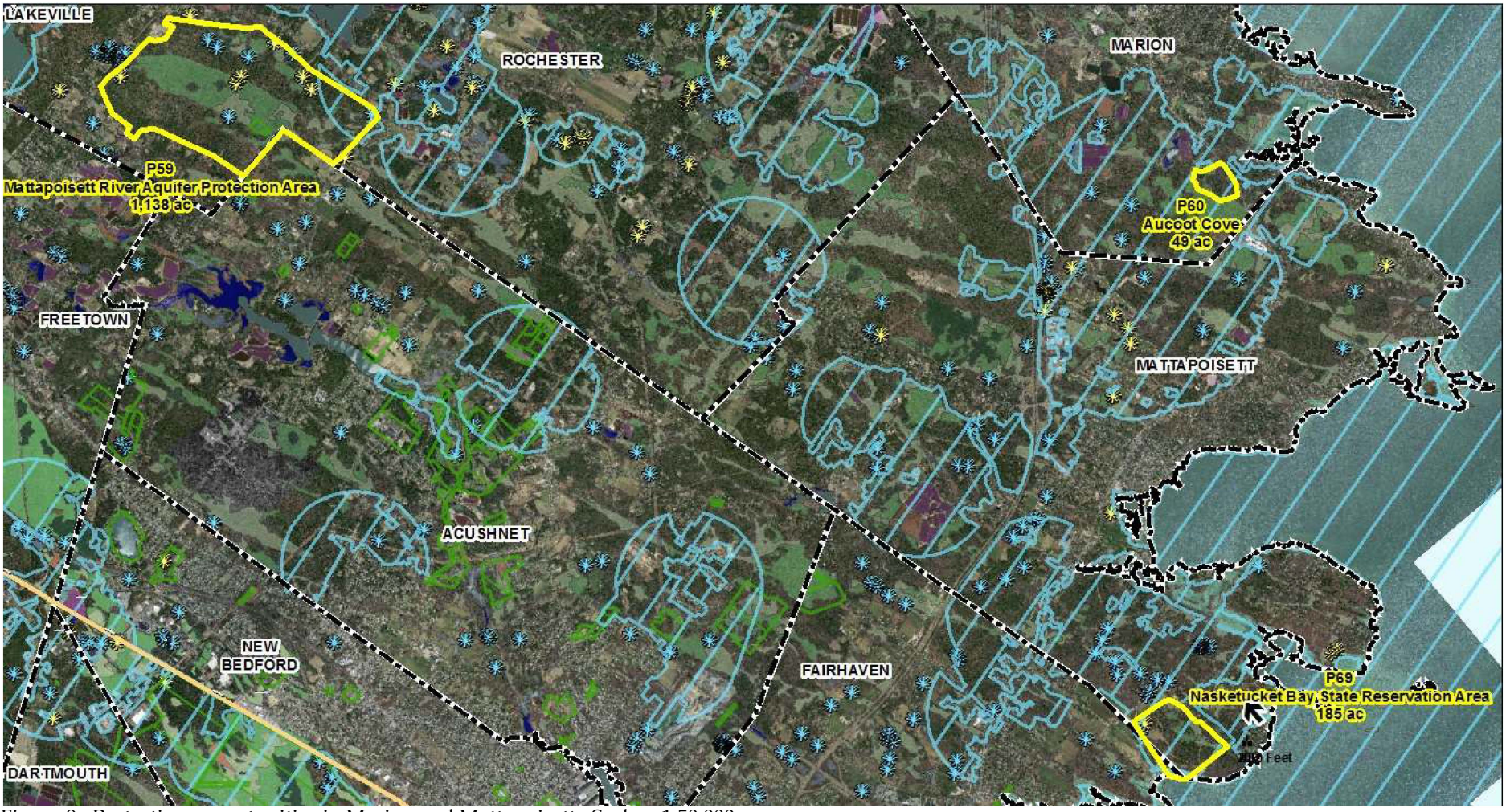


Figure 9. Protection opportunities in Marion and Mattapoisett. Scale = 1:50,000.

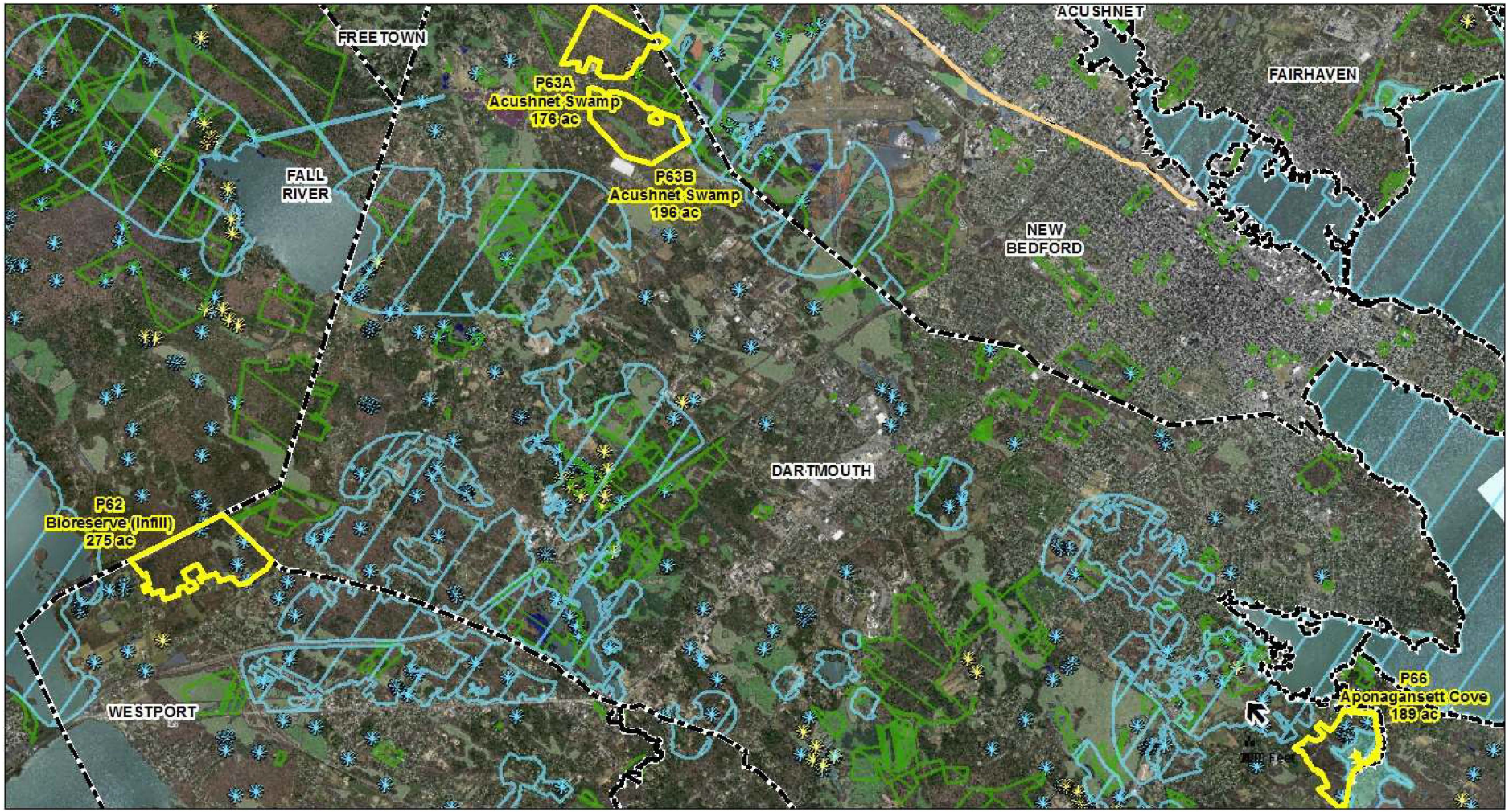


Figure 10. Protection opportunities in Dartmouth, New Bedford, and Westport. Scale = 1:50,000.

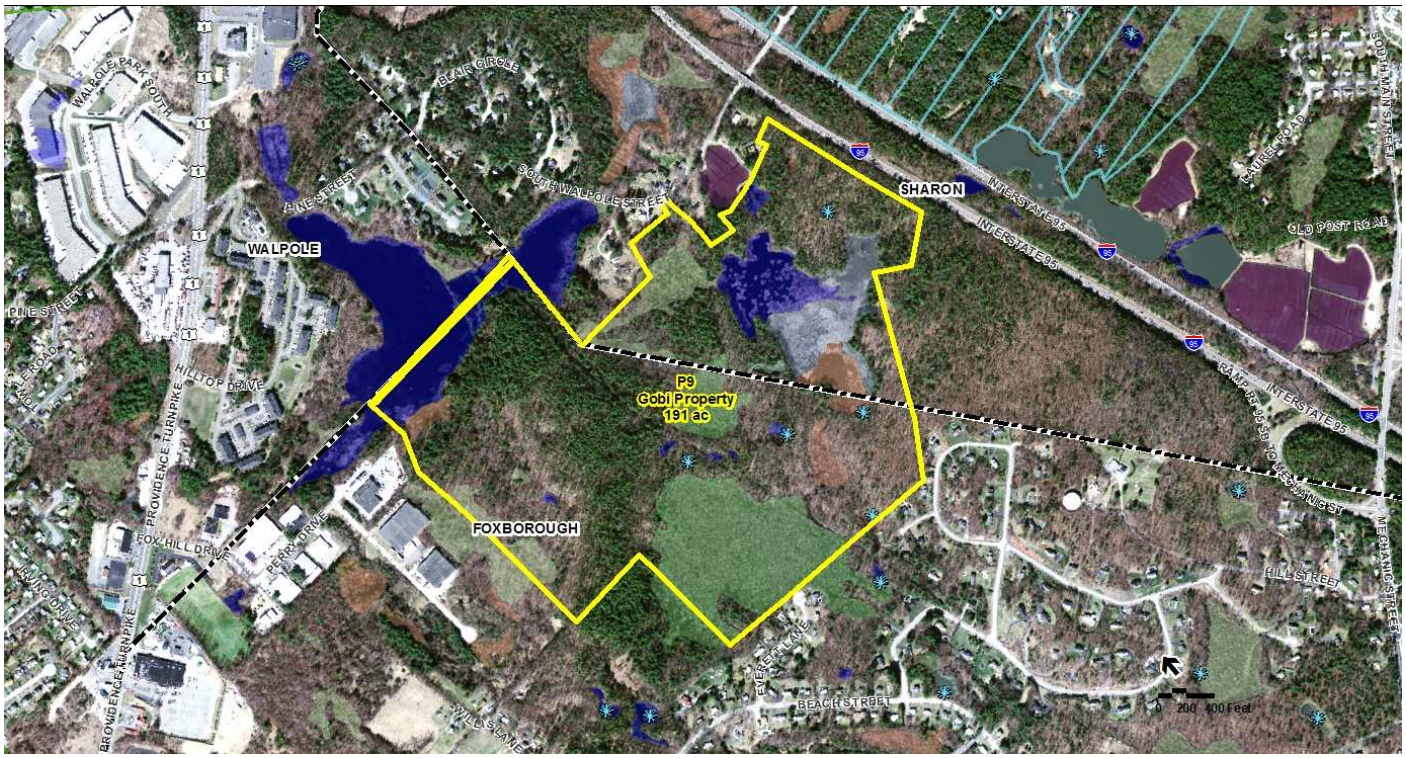


Figure 11. Area P9, Gobi Property. Scale = 1:7,500.

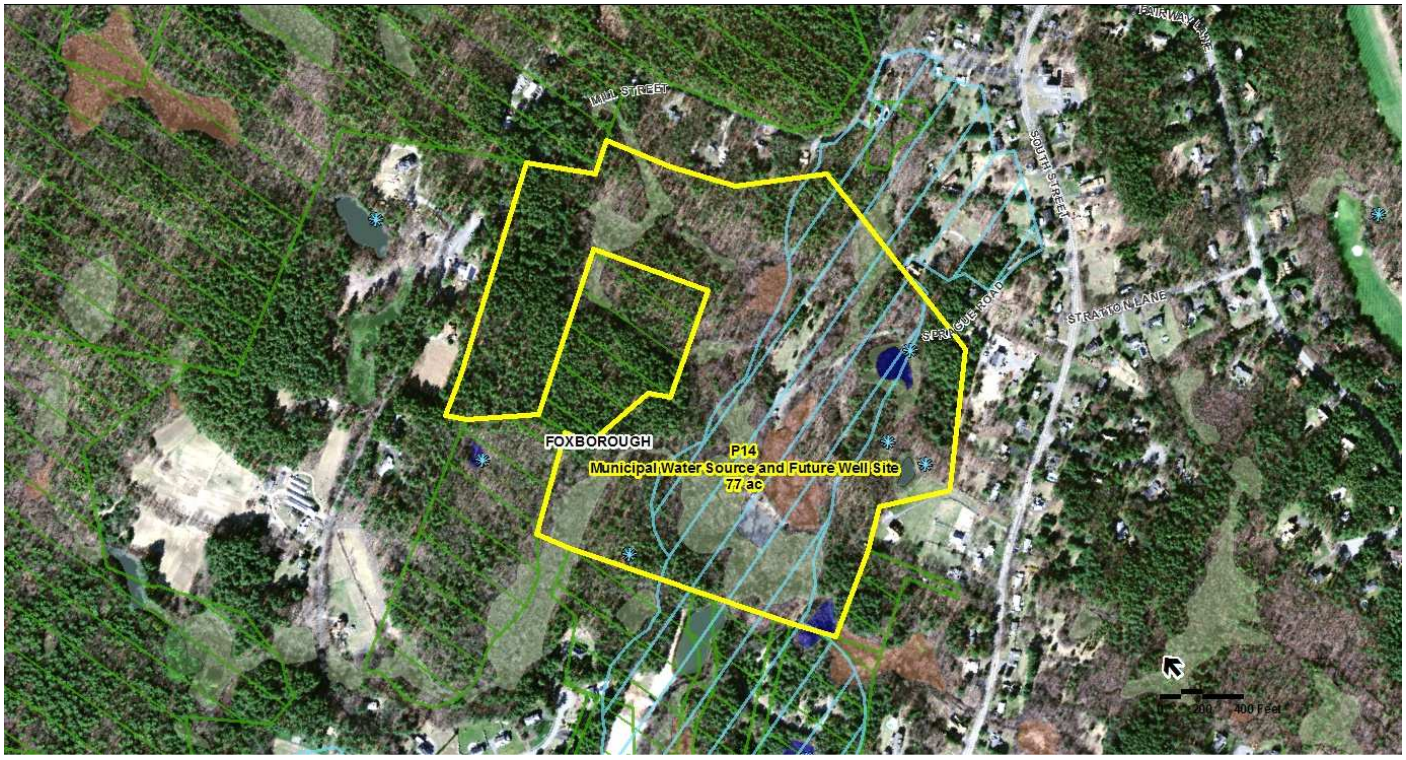


Figure 12. Area P14, Municipal Water Source and Future Well Site. Scale = 1:5,000.

Figure 13. Area P17, Canoe River ACEC (MAPC Region). Scale = 1:2,500.

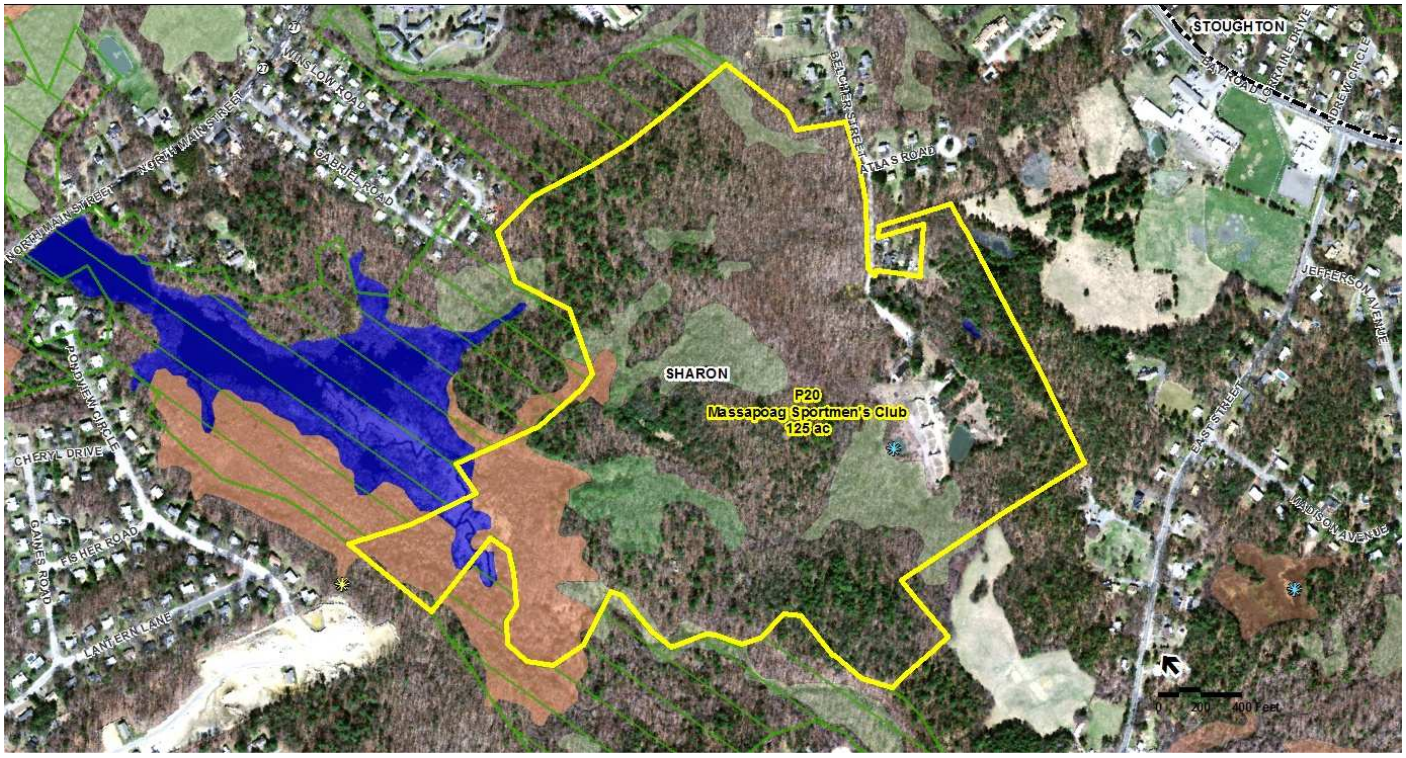


Figure 14. Area P20, Massapoag Sportsmen's Club. Scale = 1:5,000.

Figure 15. Area P22, Sreda Property. Scale = 1:5,000.

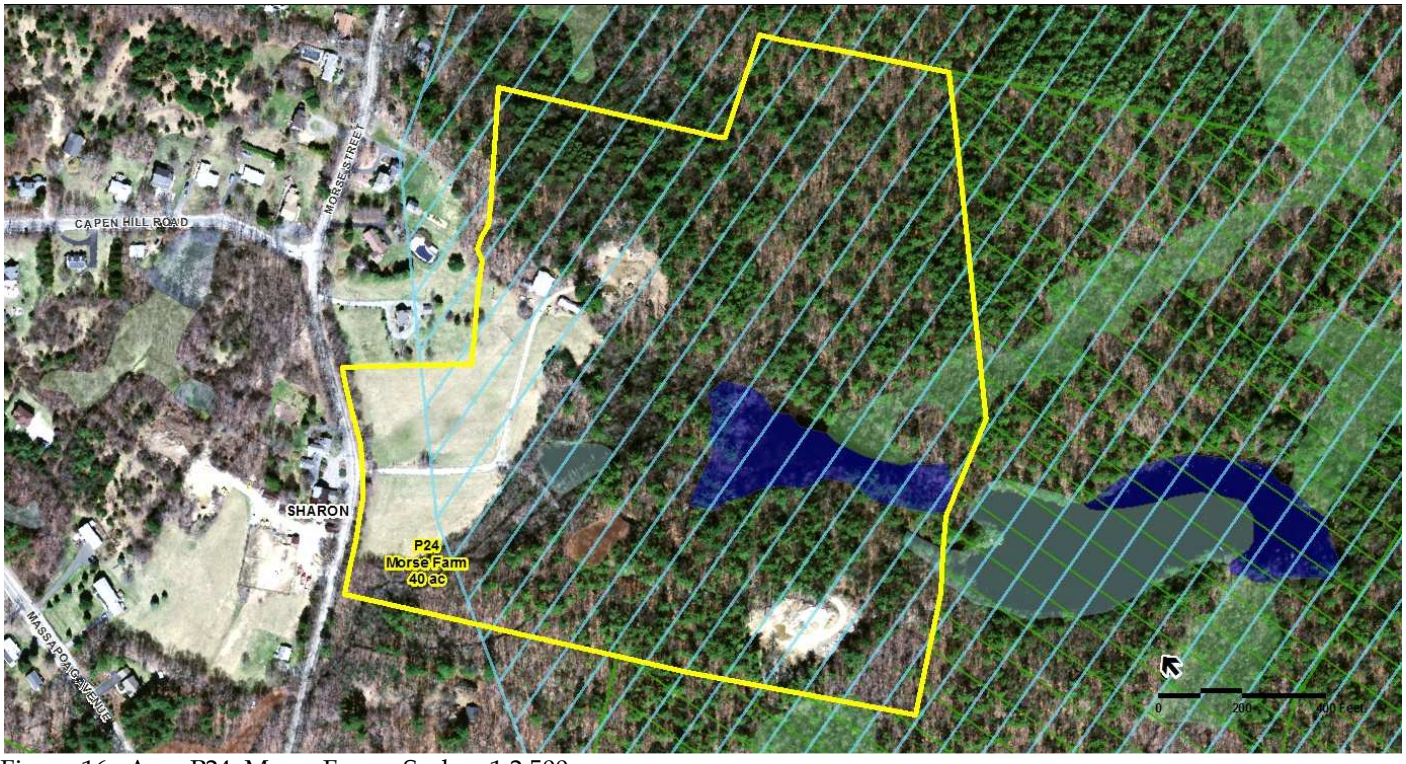


Figure 16. Area P24, Morse Farm. Scale = 1:2,500.

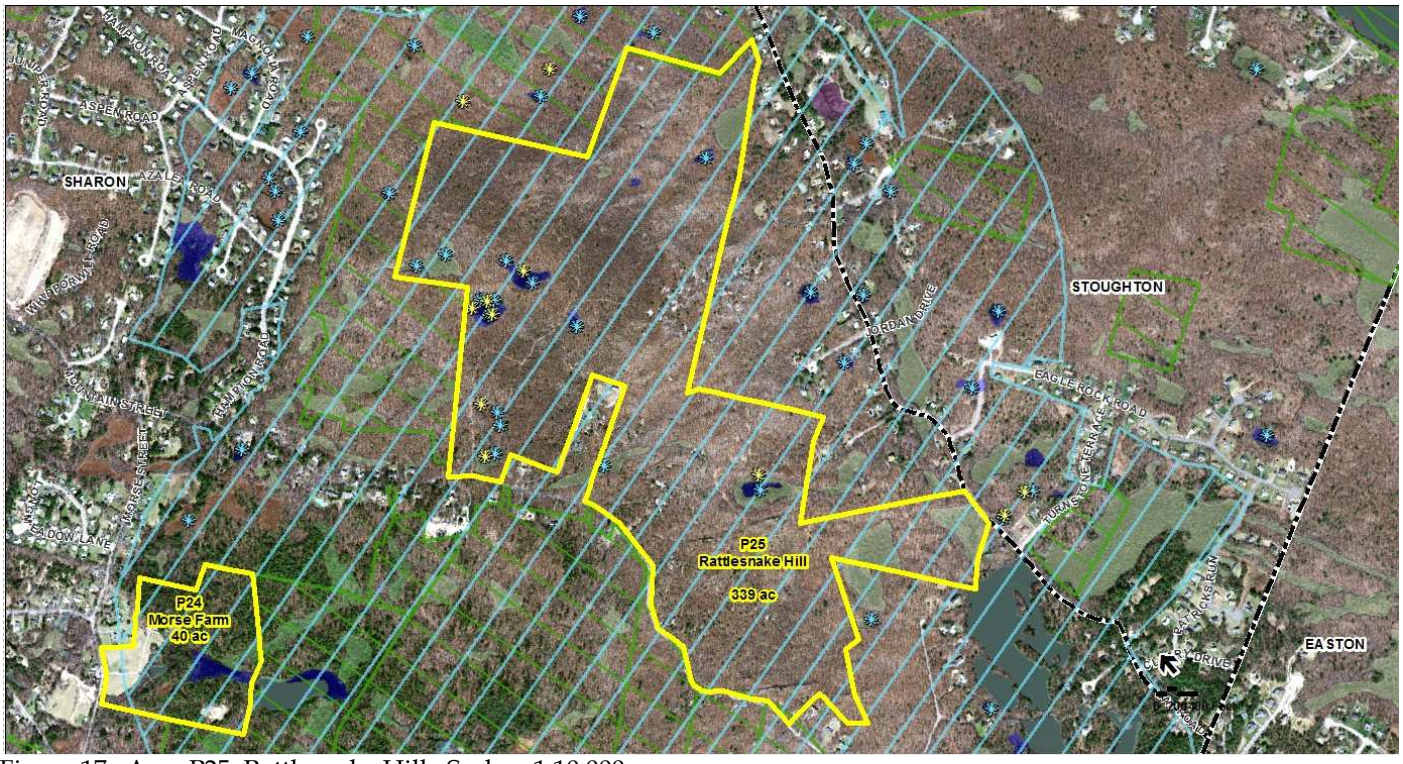


Figure 17. Area P25, Rattlesnake Hill. Scale = 1:10,000.

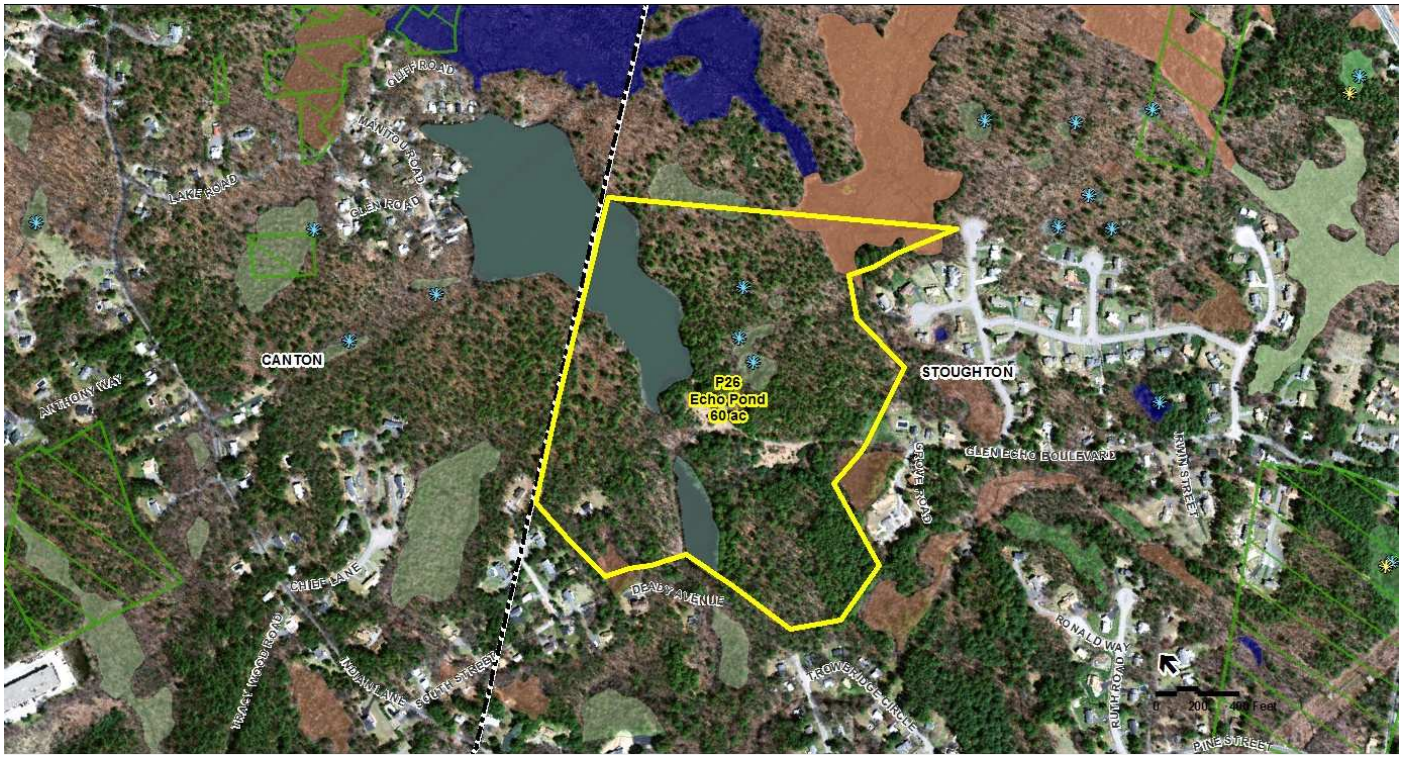


Figure 18. Area P26, Echo Pond. Scale = 1:5,000.

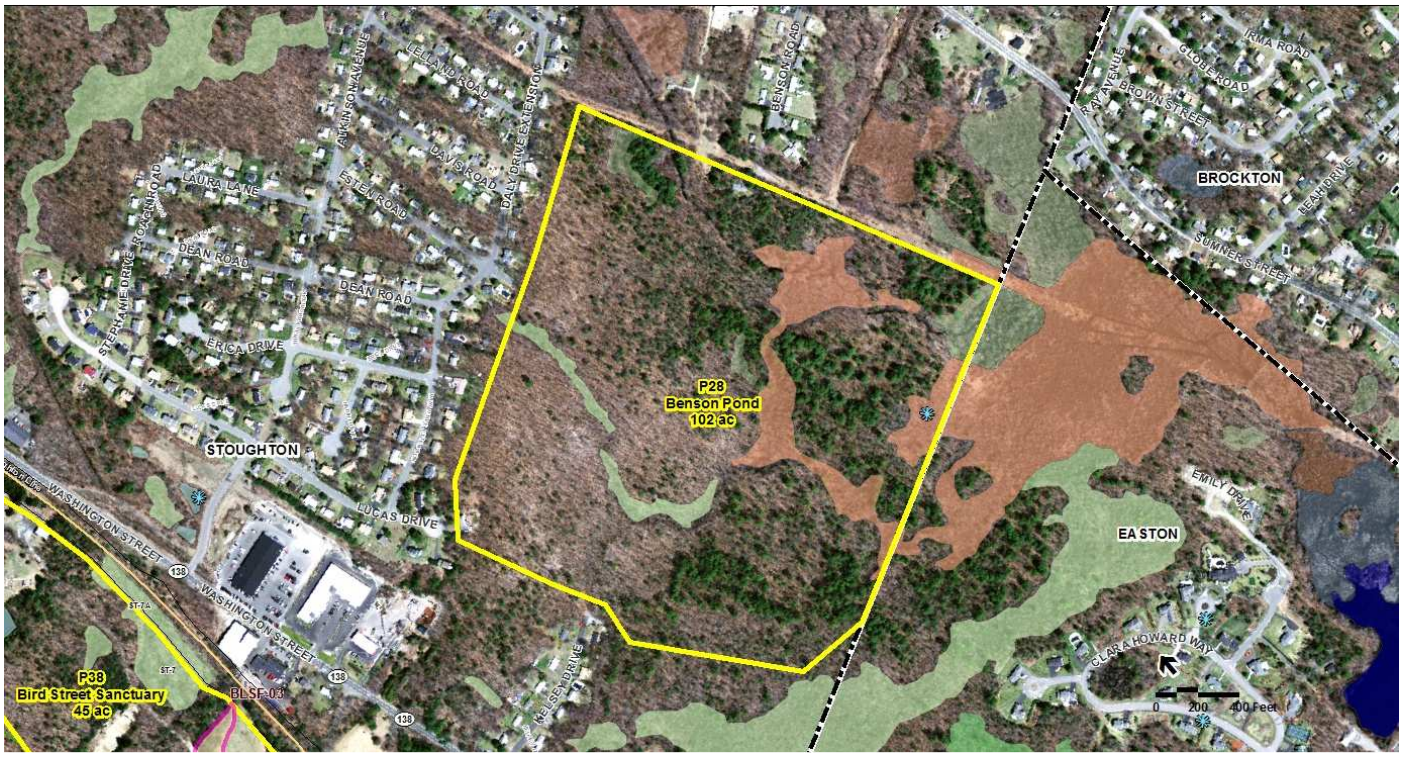


Figure 19. Area P28, Benson Pond. Scale = 1:5,000.

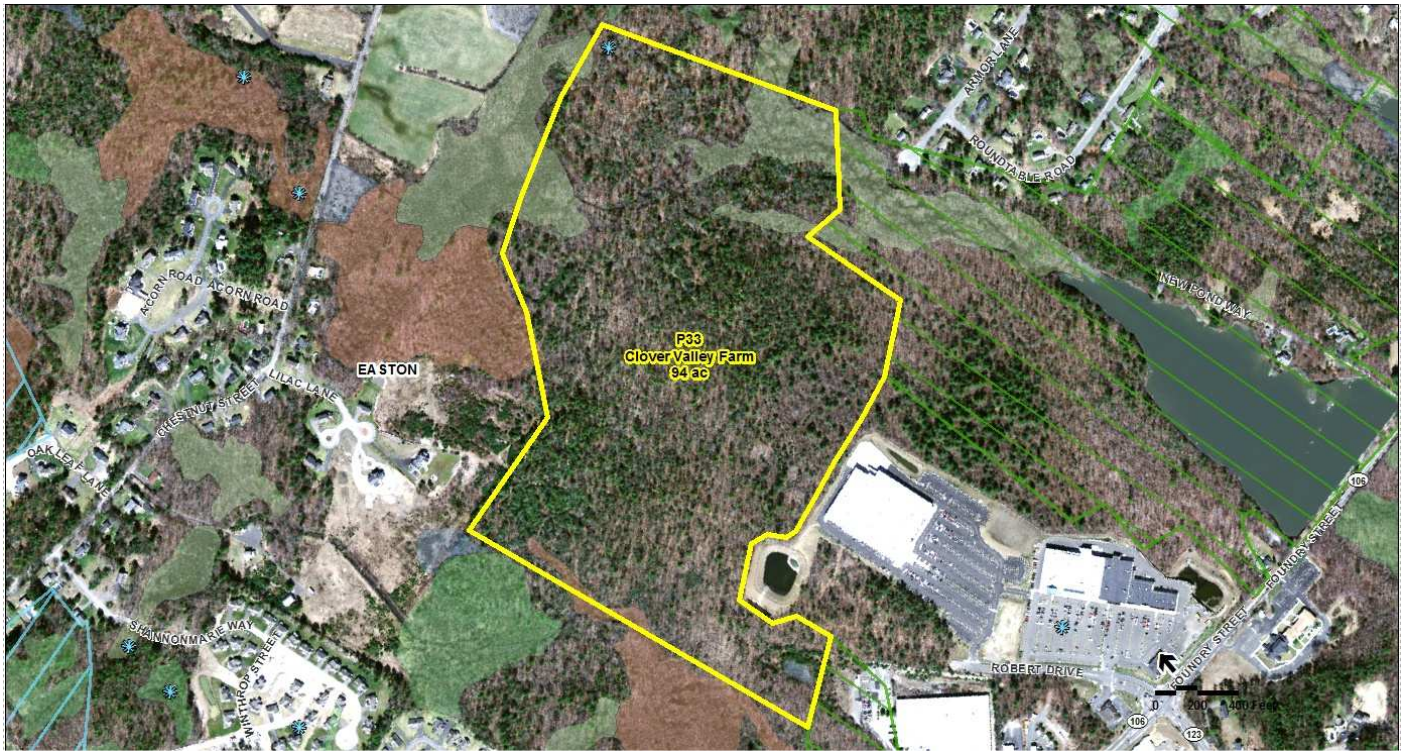


Figure 20. Area P33, Clover Valley Farm. Scale = 1:5,000.

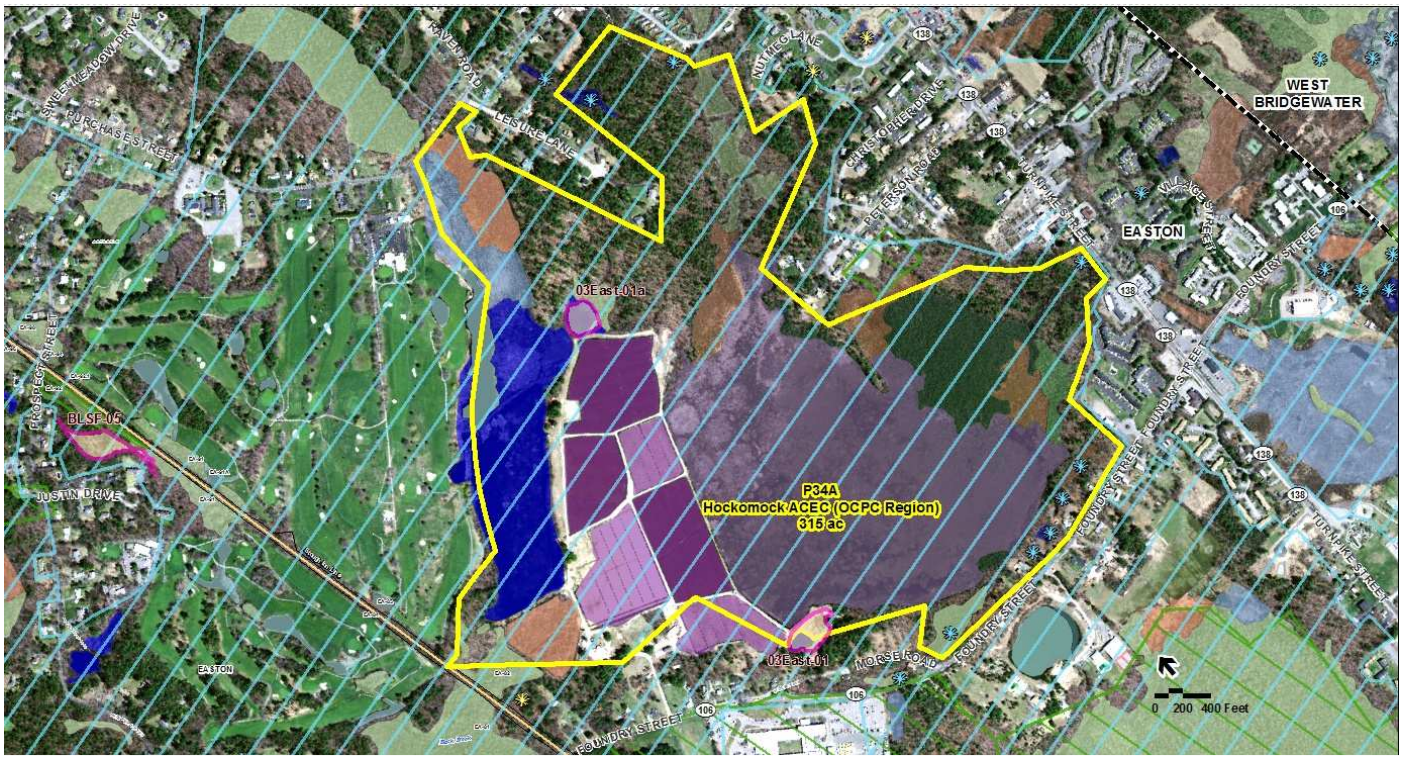


Figure 21. Area P34A, Hockomock ACEC (OCPC Region). Scale = 1:7,500.

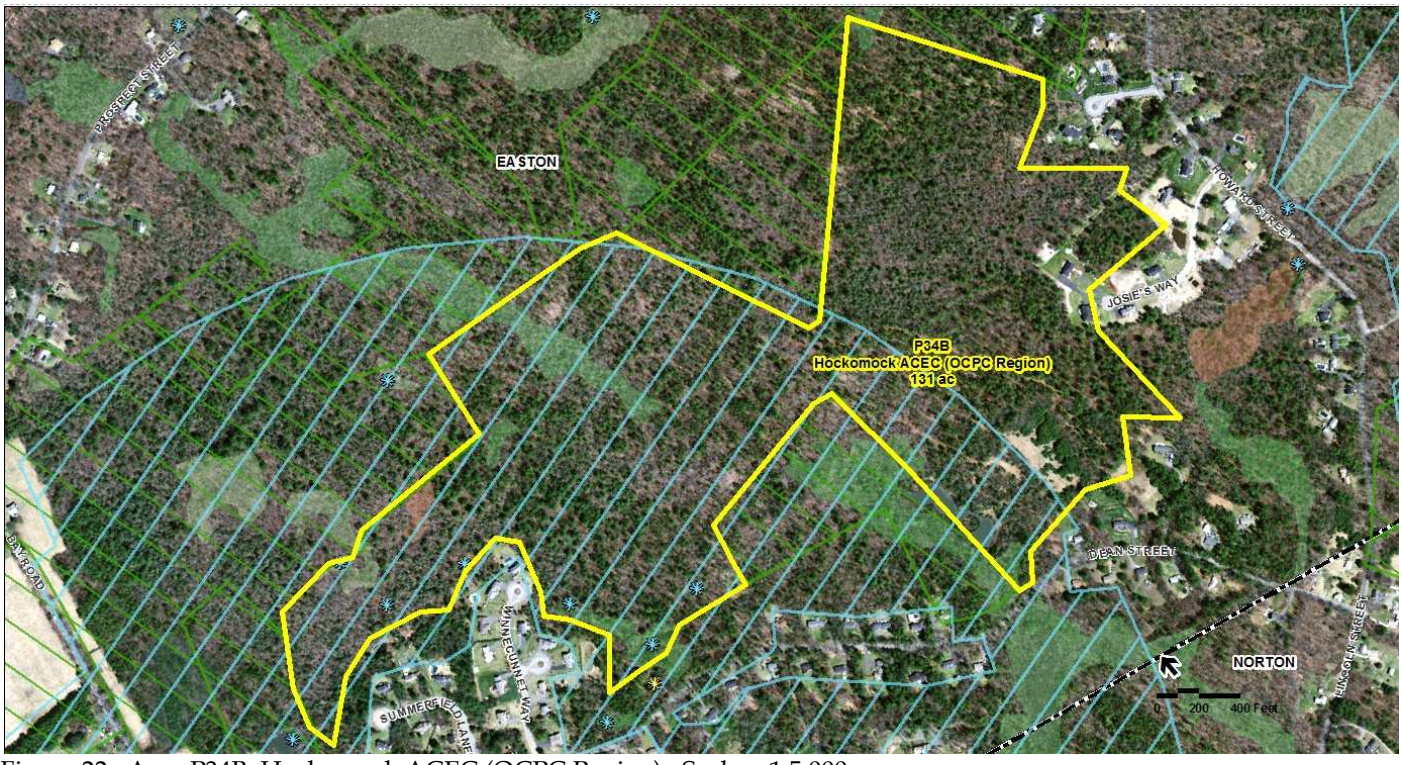


Figure 22. Area P34B, Hockomock ACEC (OCPC Region). Scale = 1:5,000.

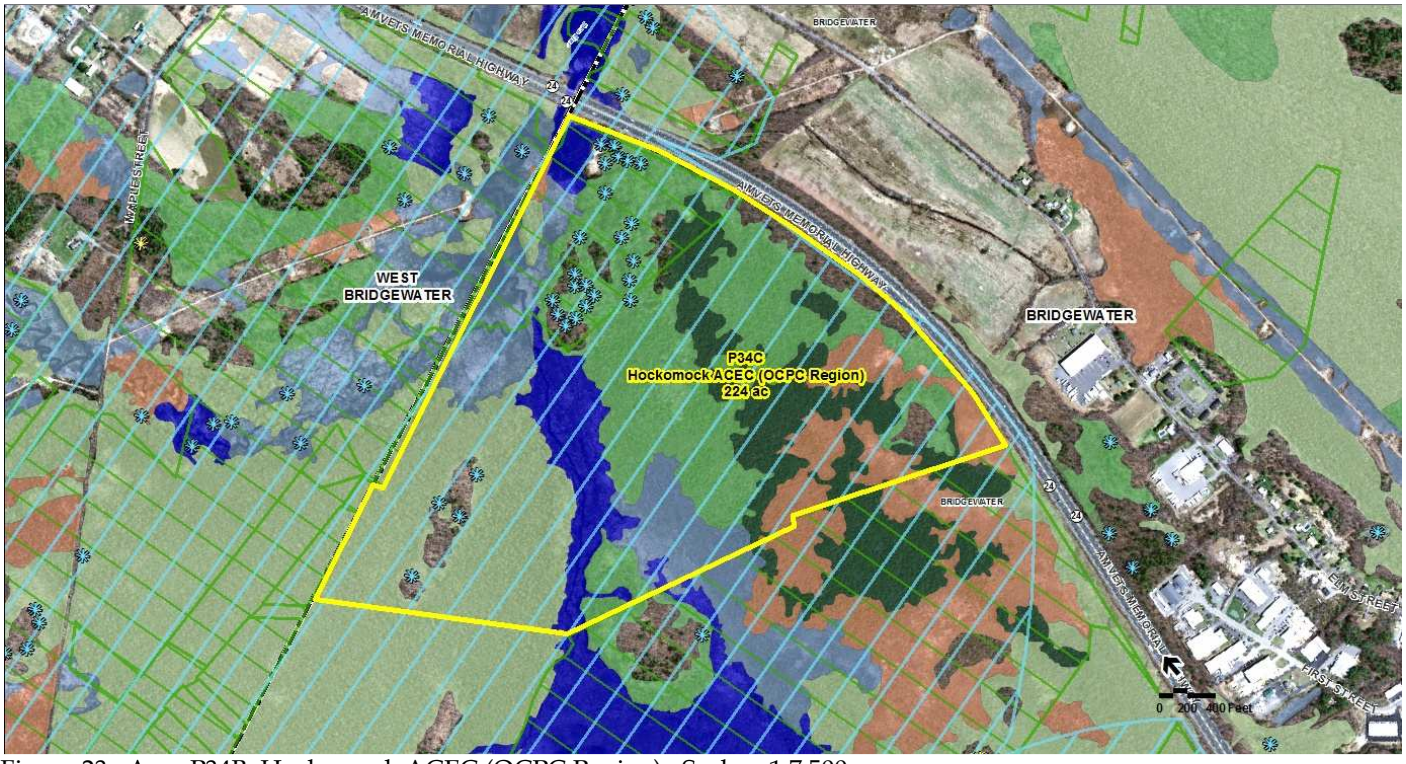


Figure 23. Area P34B, Hockomock ACEC (OCPC Region). Scale = 1:7,500.

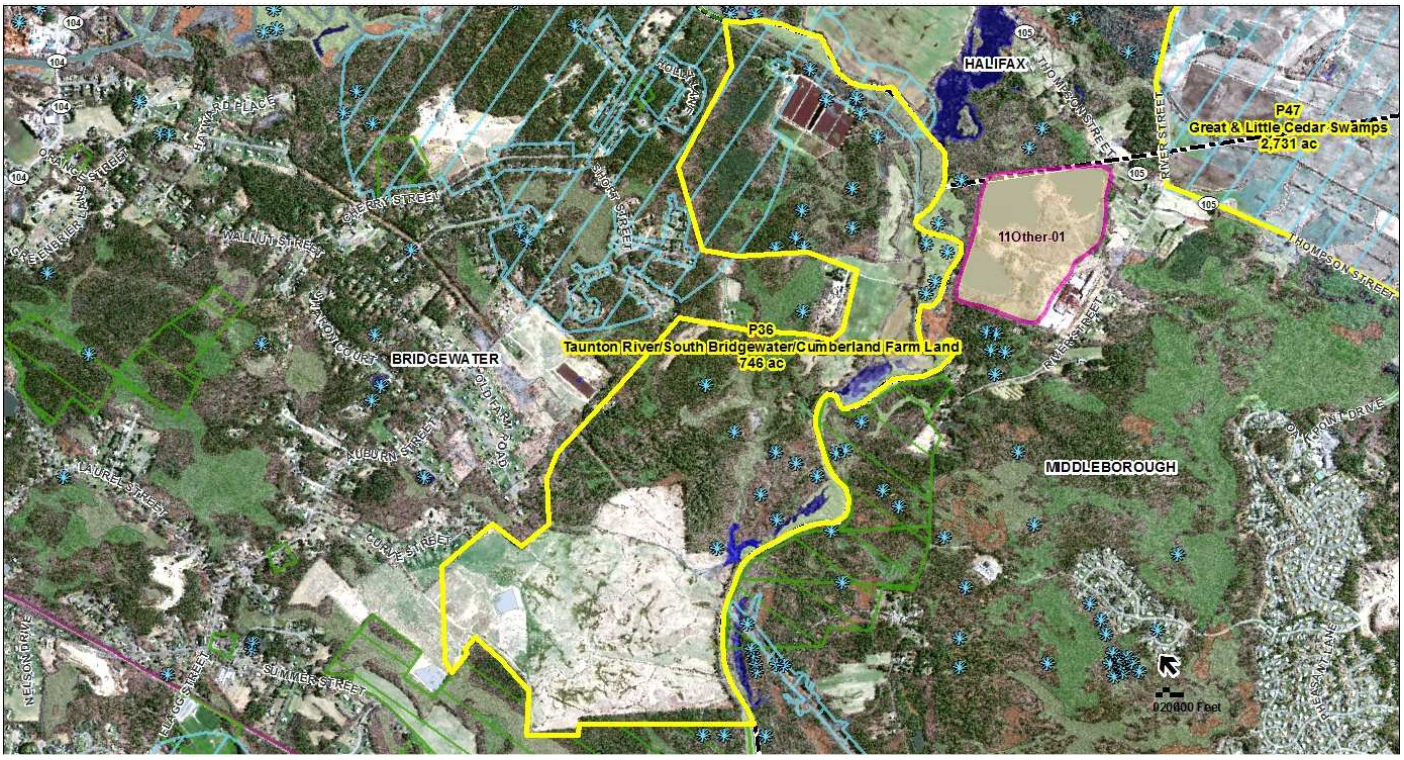


Figure 24. Area P36, Taunton River/South Bridgewater/Cumberland Farm Land. Scale = 1:15,000.

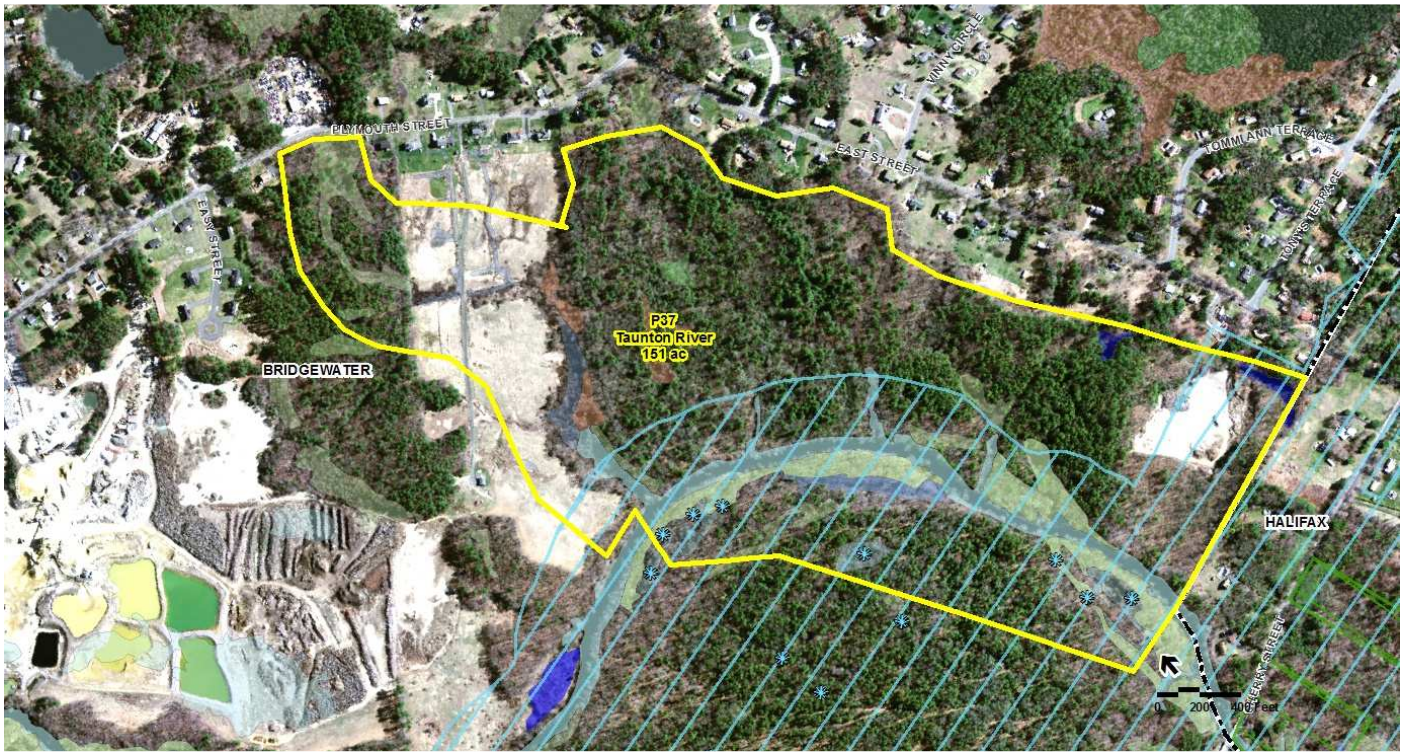


Figure 25. Area P37, Taunton River. Scale = 1:5,000.

Figure 26. Area P38, Bird Street Sanctuary. Scale = 1:5,000.

Figure 27. Area P40, Southworth Pond and Lipsky Fields. Scale = 1:5,000.

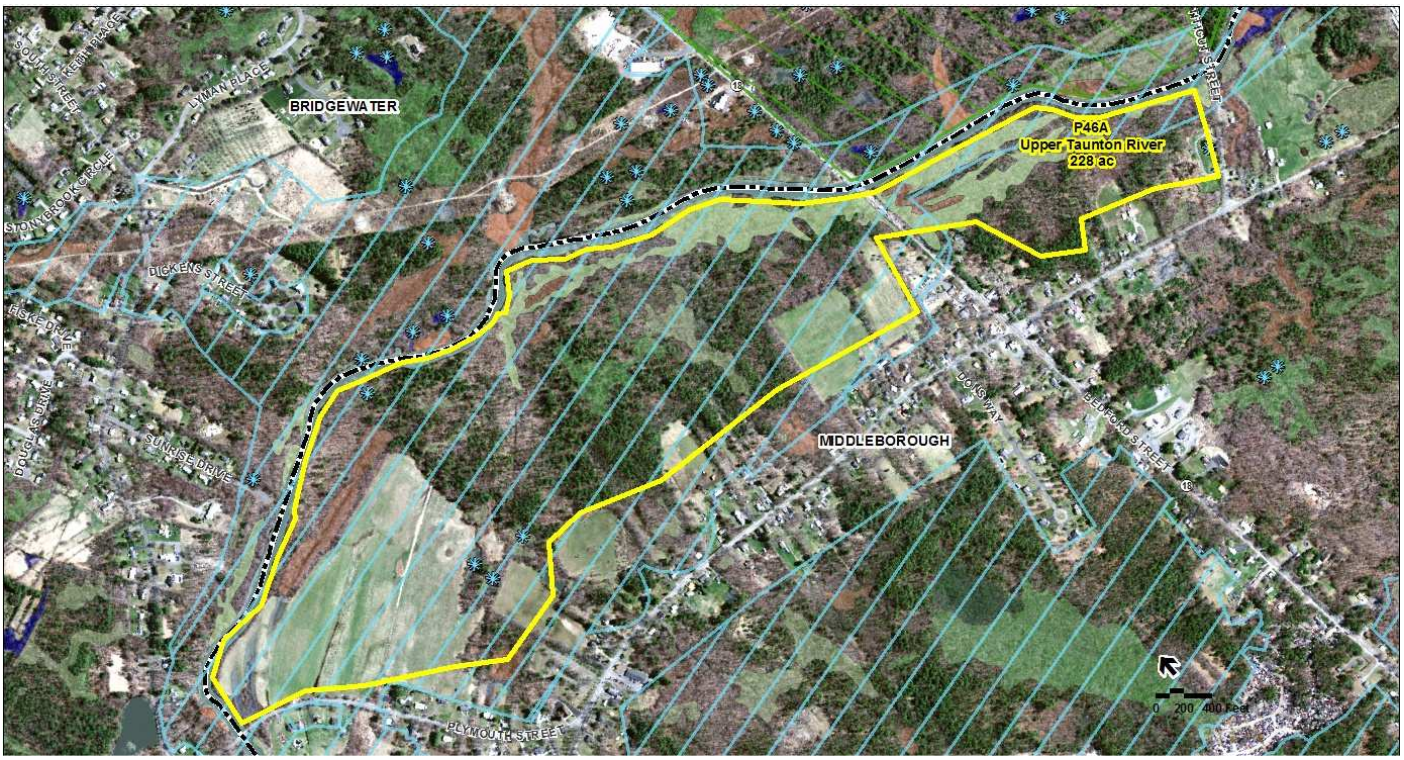


Figure 28. Area P46A, Upper Taunton River. Scale = 1:7,500.

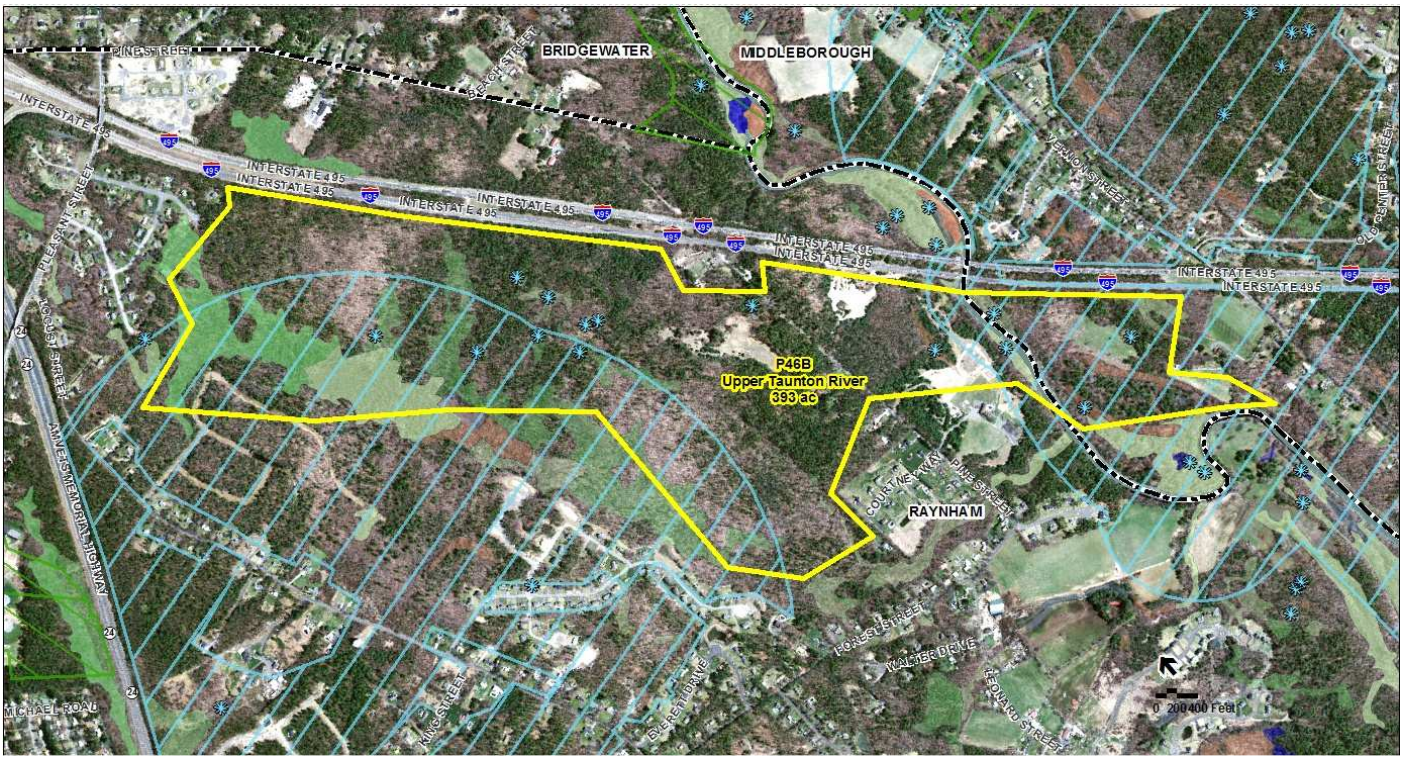


Figure 29. Area P46B, Upper Taunton River. Scale = 1:10,000.

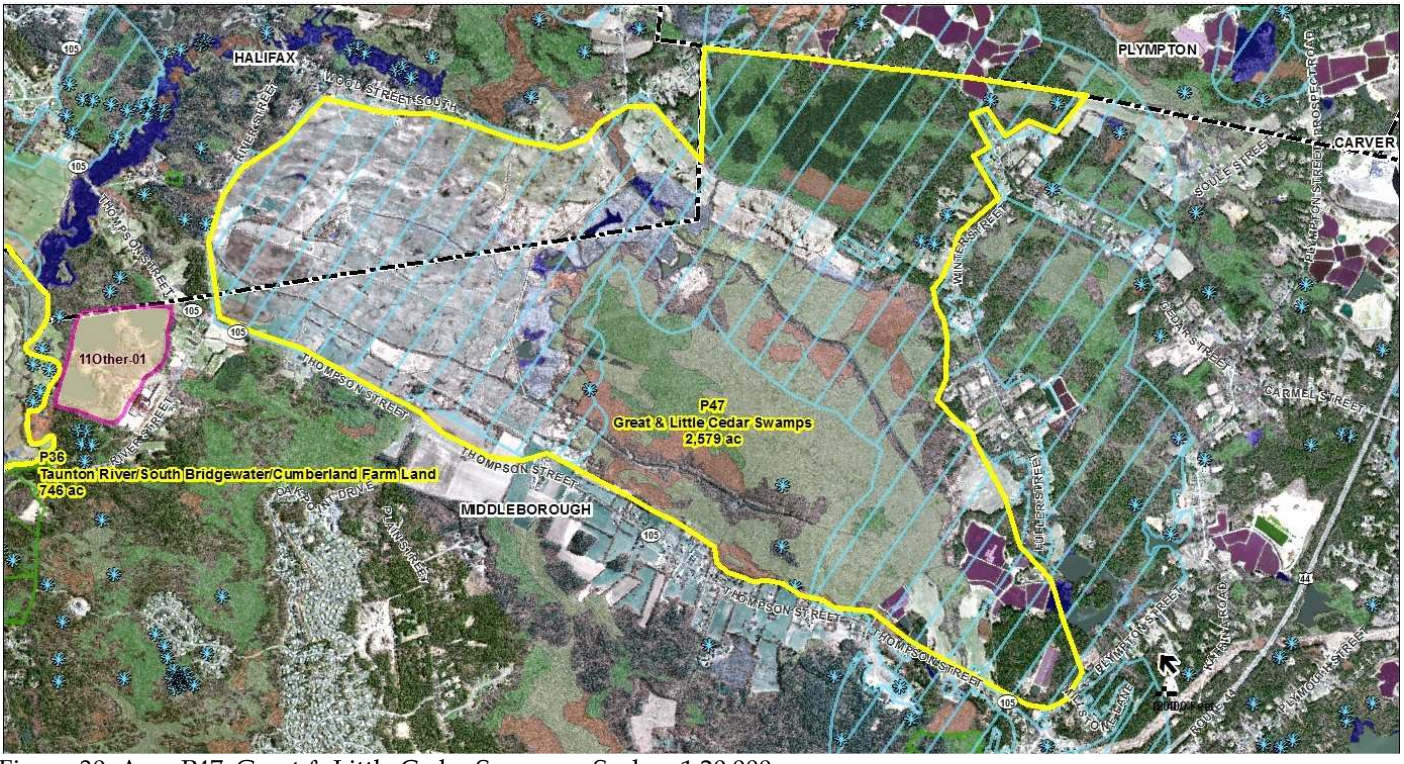


Figure 30. Area P47, Great & Little Cedar Swamps. Scale = 1:20,000.

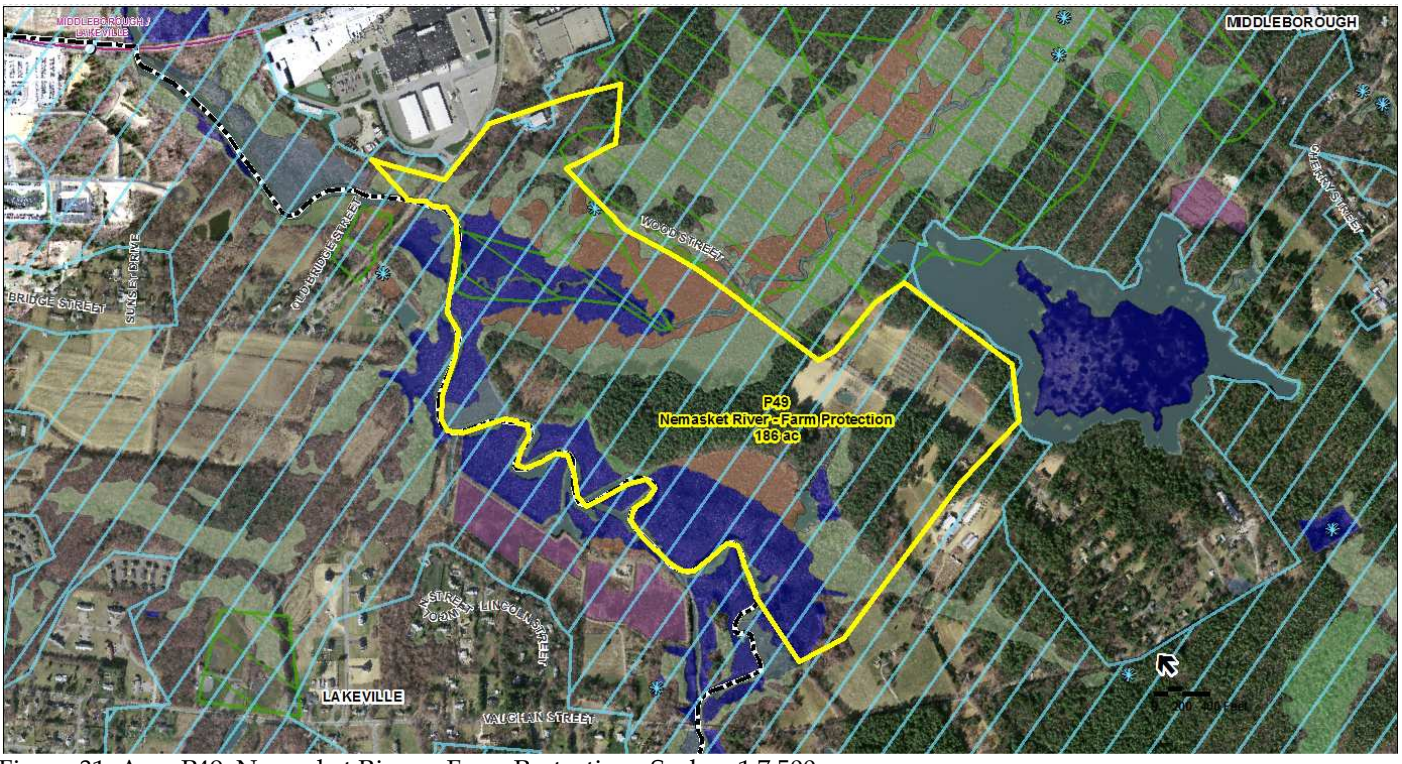


Figure 31. Area P49, Nemasket River – Farm Protection. Scale = 1:7,500.

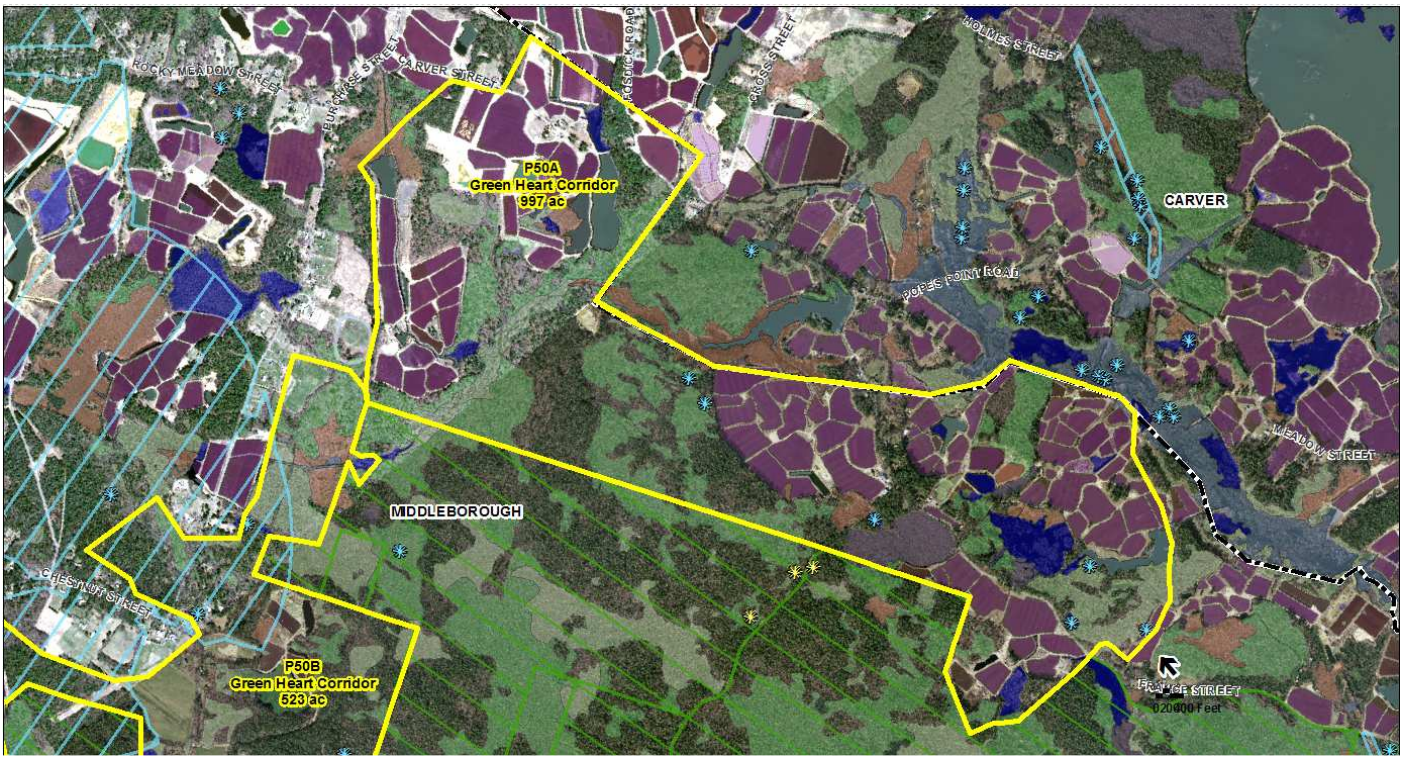


Figure 32. Area P50A, Green Heart Corridor. Scale = 1:15,000.

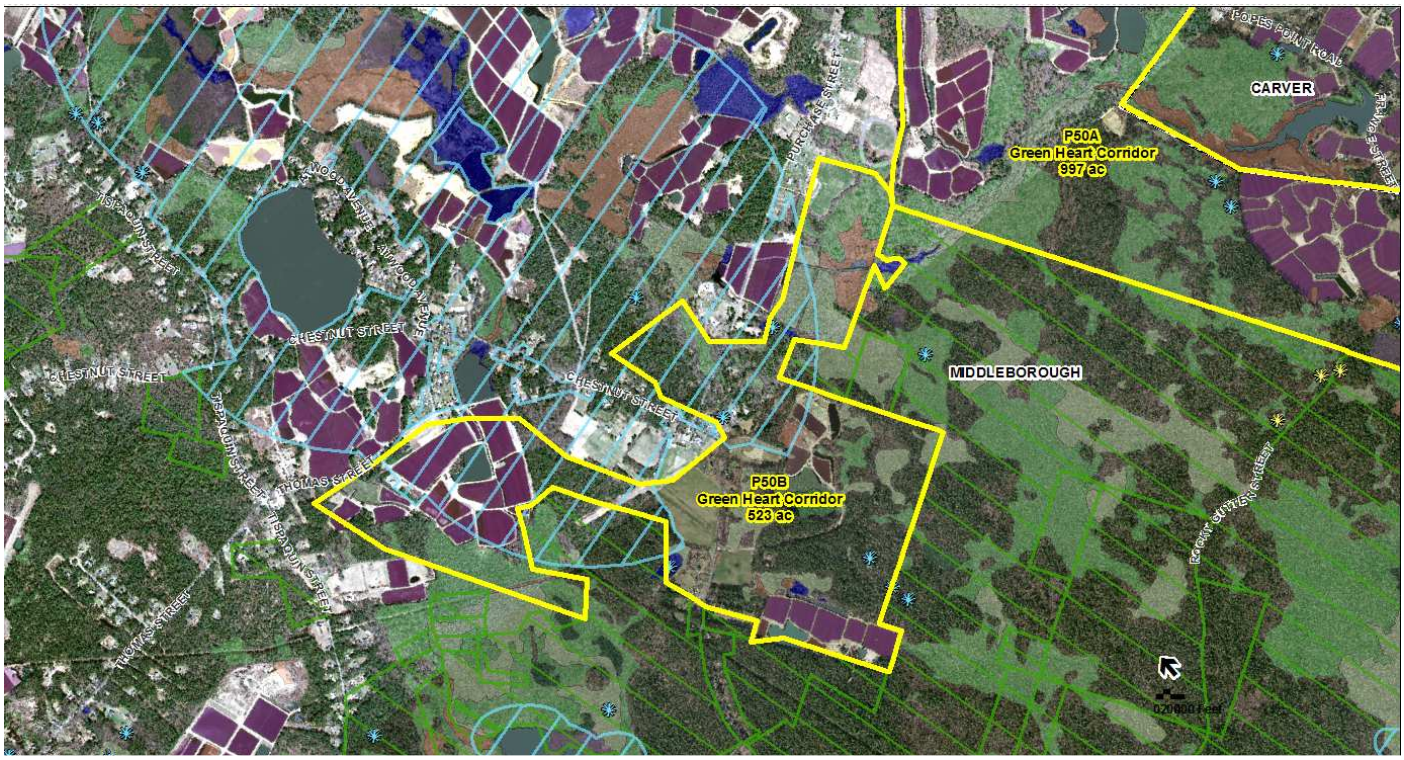


Figure 33. Area P50B, Green Heart Corridor. Scale = 1:15,000.

Figure 34. Area P51, Thatcher Pond. Scale = 1:5,000.

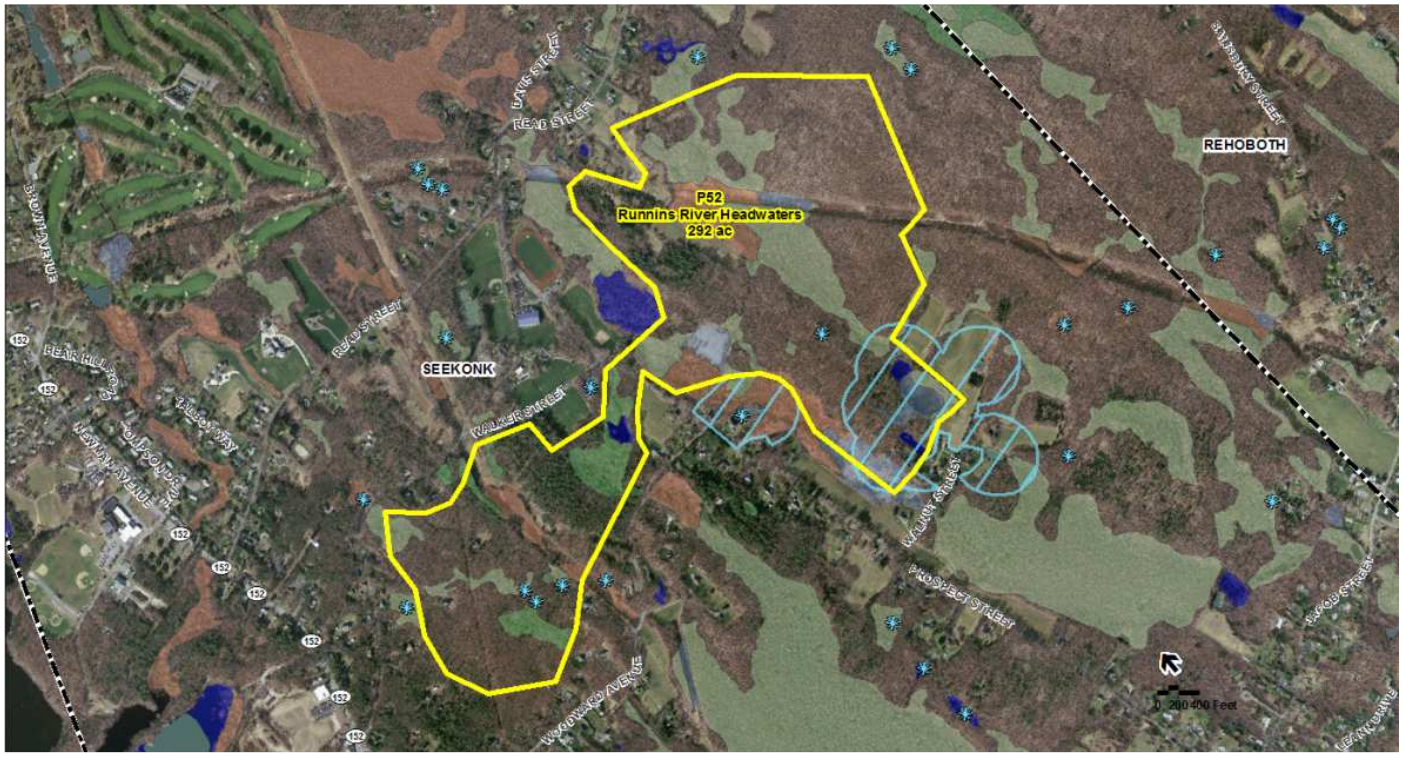


Figure 35. Area P52, Runnins River Headwaters. Scale = 1:10,000.

Figure 36. Area P53, Palmer River Aquifer/Zone II Protection Area. Scale = 1:5,000.

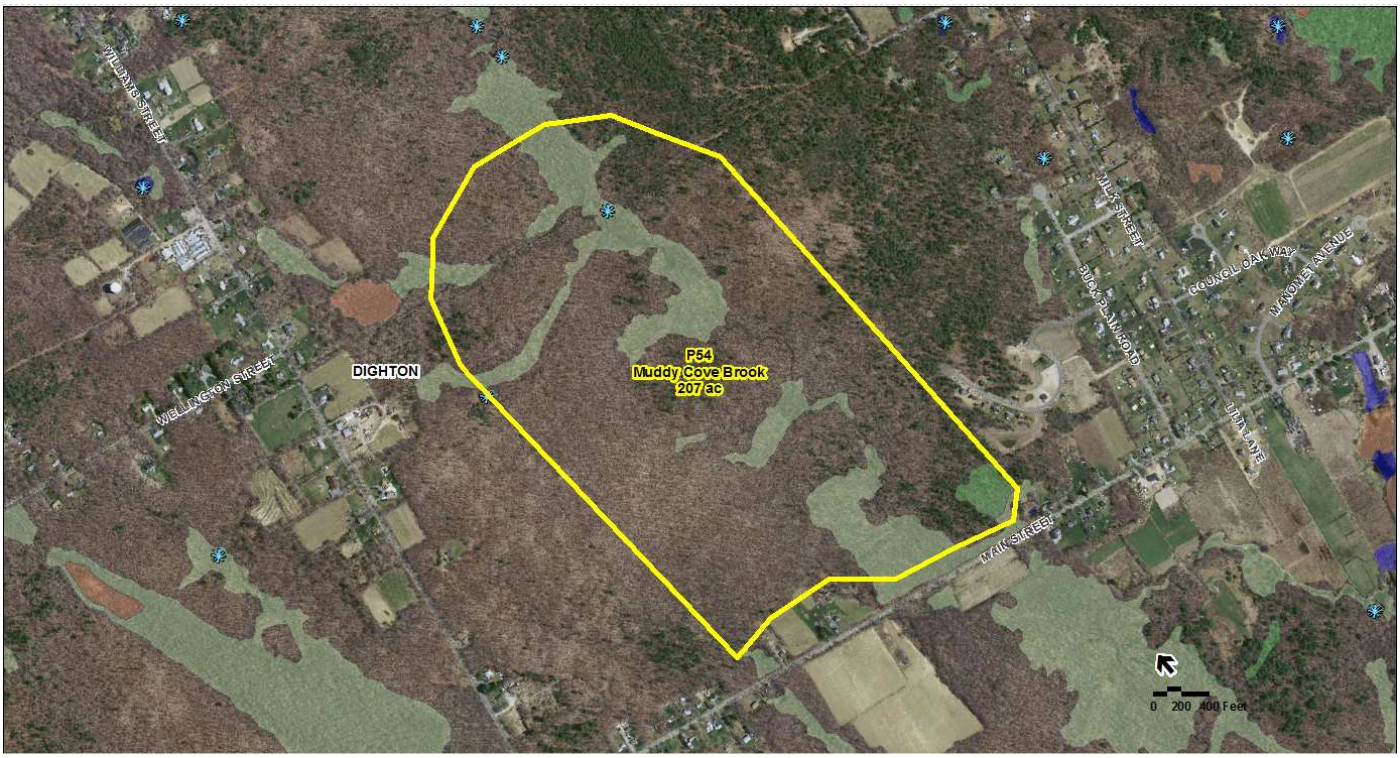


Figure 37. Area P54, Muddy Cove Brook. Scale = 1:7,500.

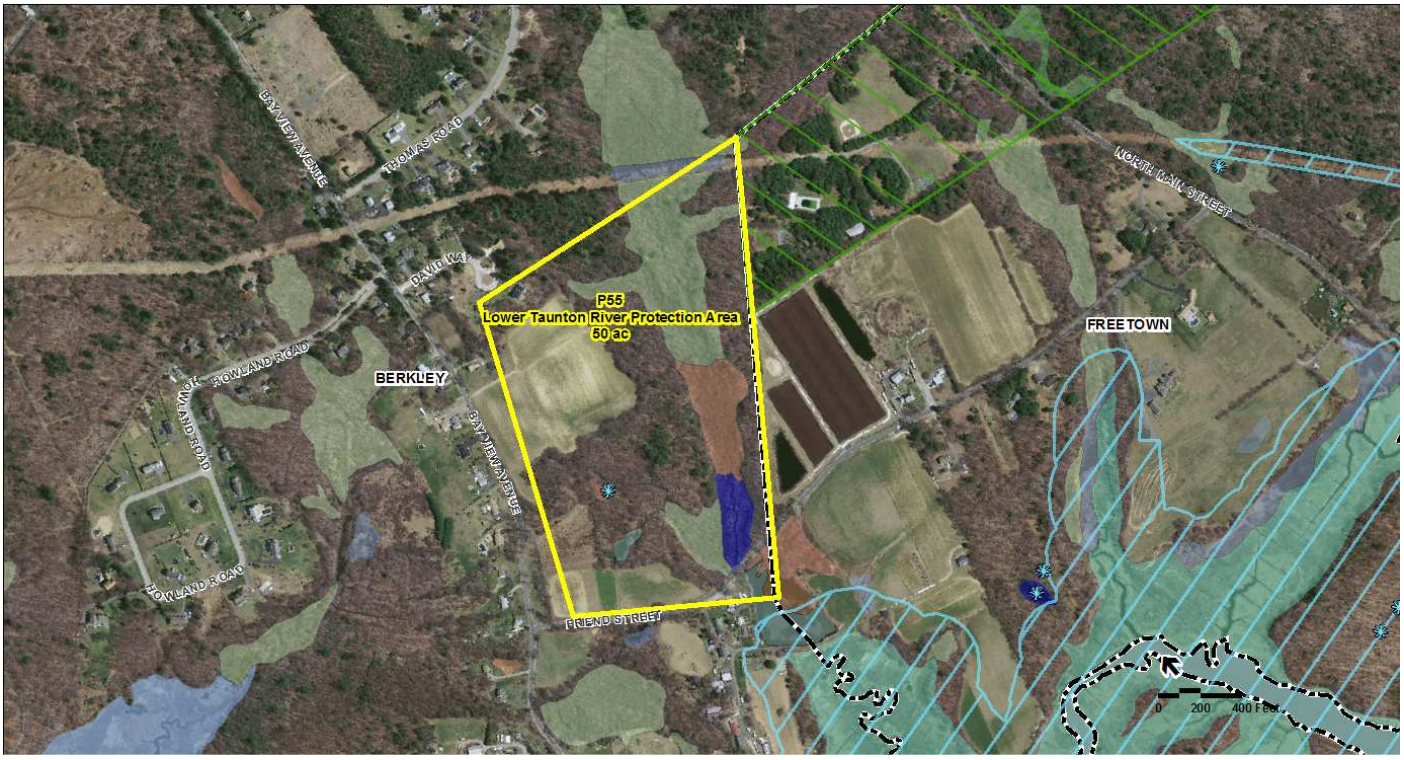


Figure 38. Area P55, Lower Taunton River Protection Area. Scale = 1:5,000.

Figure 39. Area P56, Acidic Fen. Scale = 1:7,500.

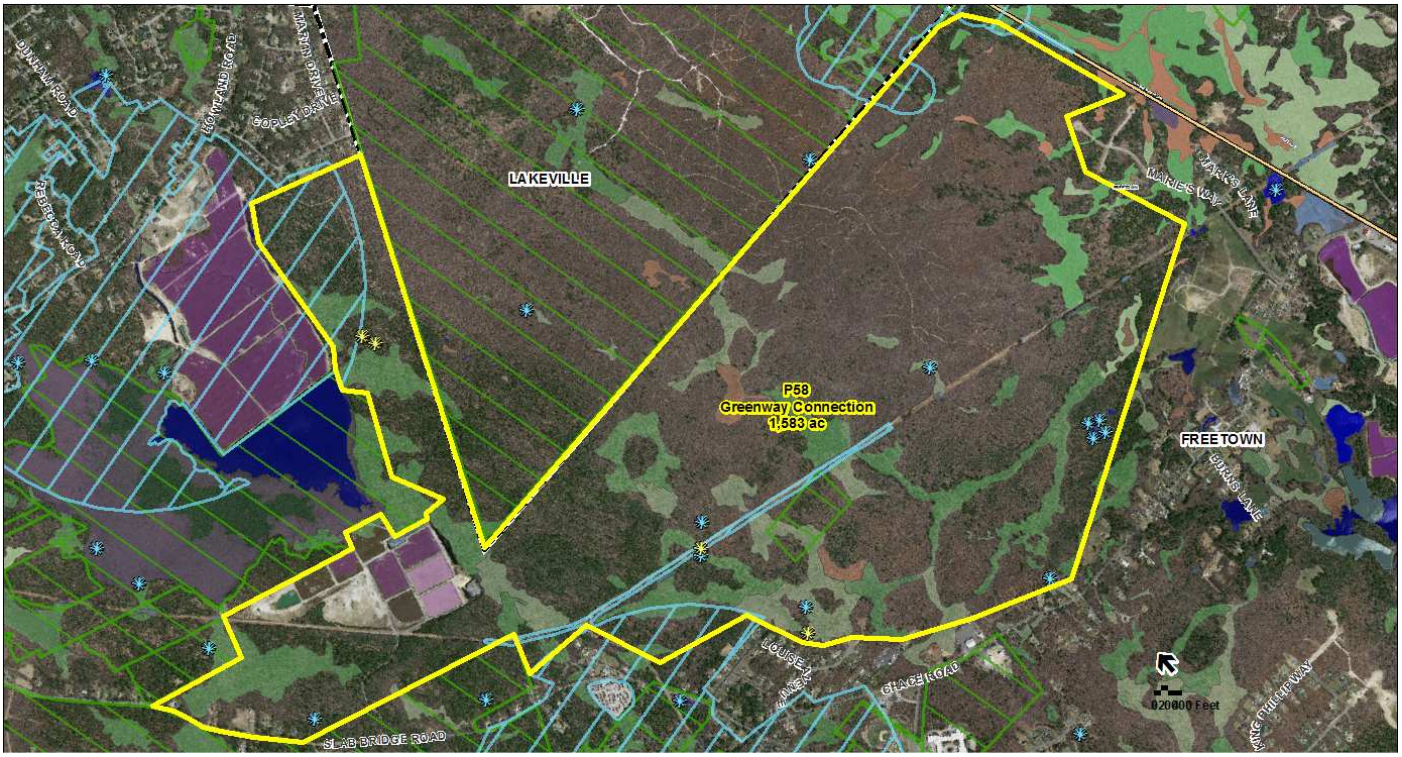


Figure 40 Area P58, Greenway Connection. Scale = 1:15,000.

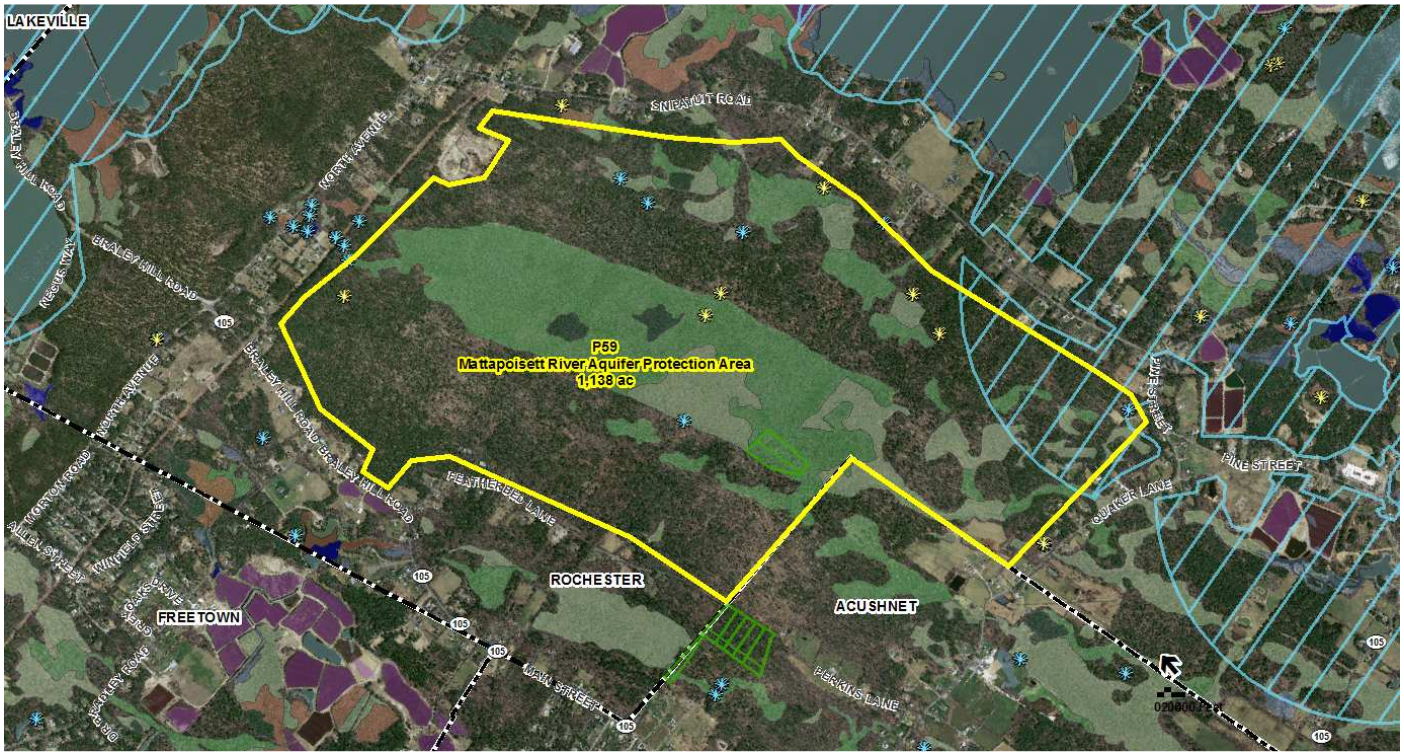


Figure 41. Area P59, Mattapoisett River Aquifer Protection Area. Scale = 1:15,000.

Figure 42. Area P60, Aucoot Cove. Scale = 1:2,500.

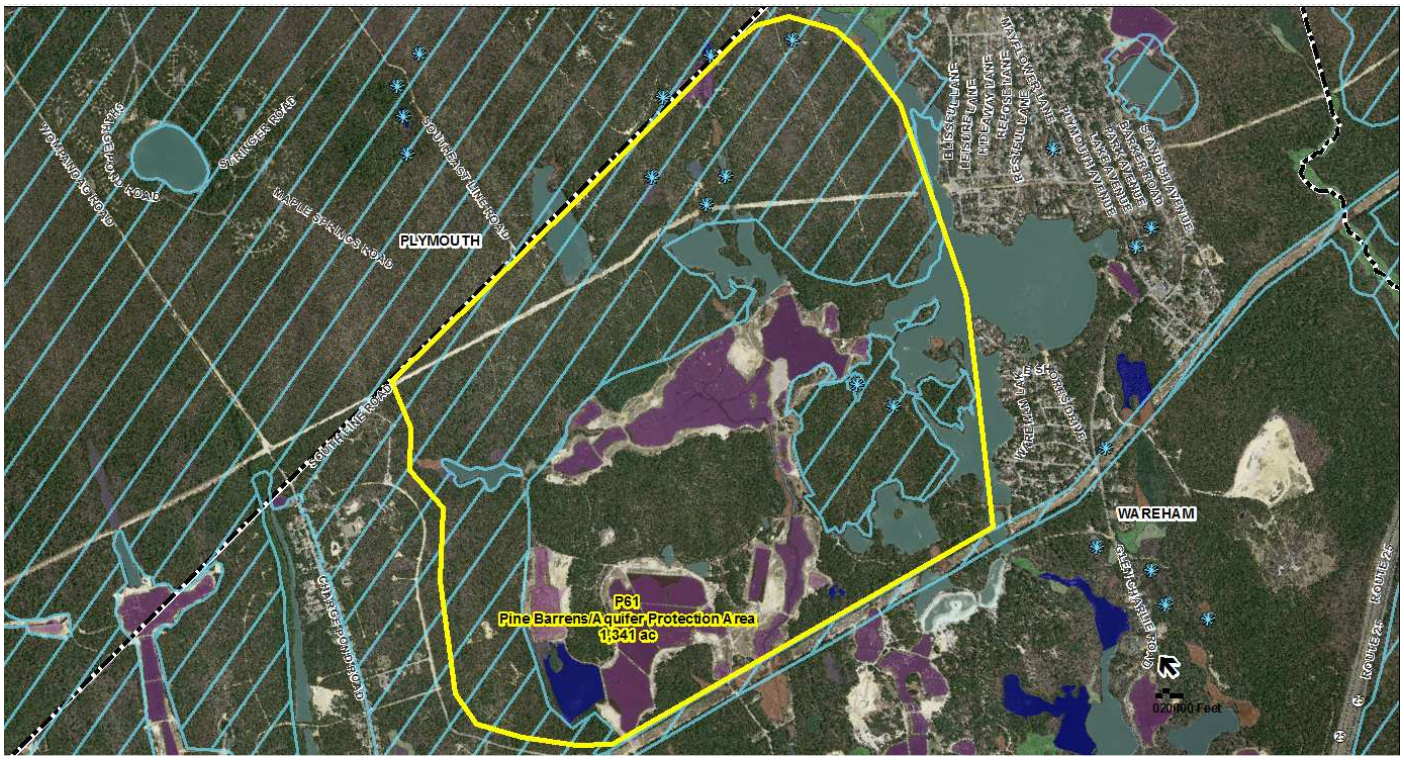


Figure 43. Area P61, Pine Barrens/Aquifer Protection Area. Scale = 1:15,000.

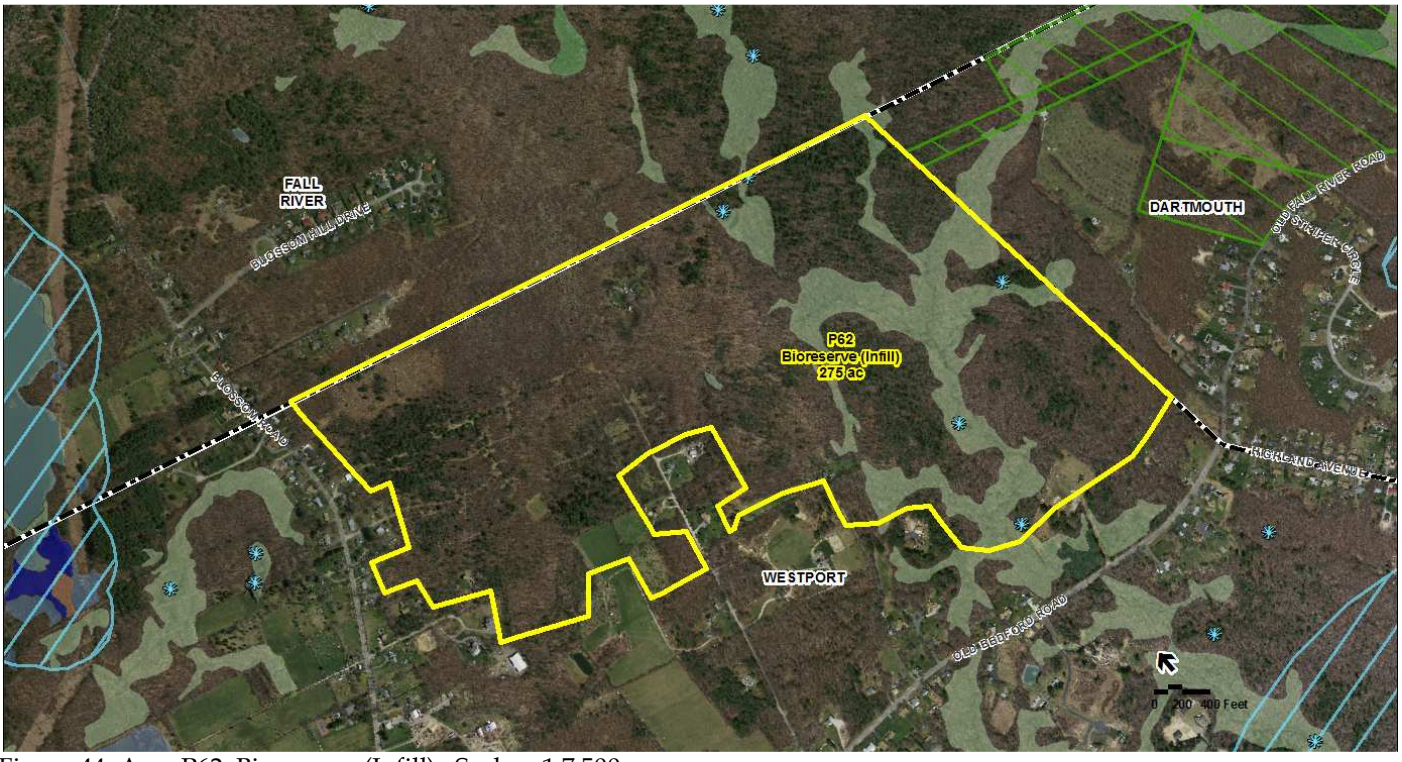


Figure 44. Area P62, Bioreserve (Infill). Scale = 1:7,500.

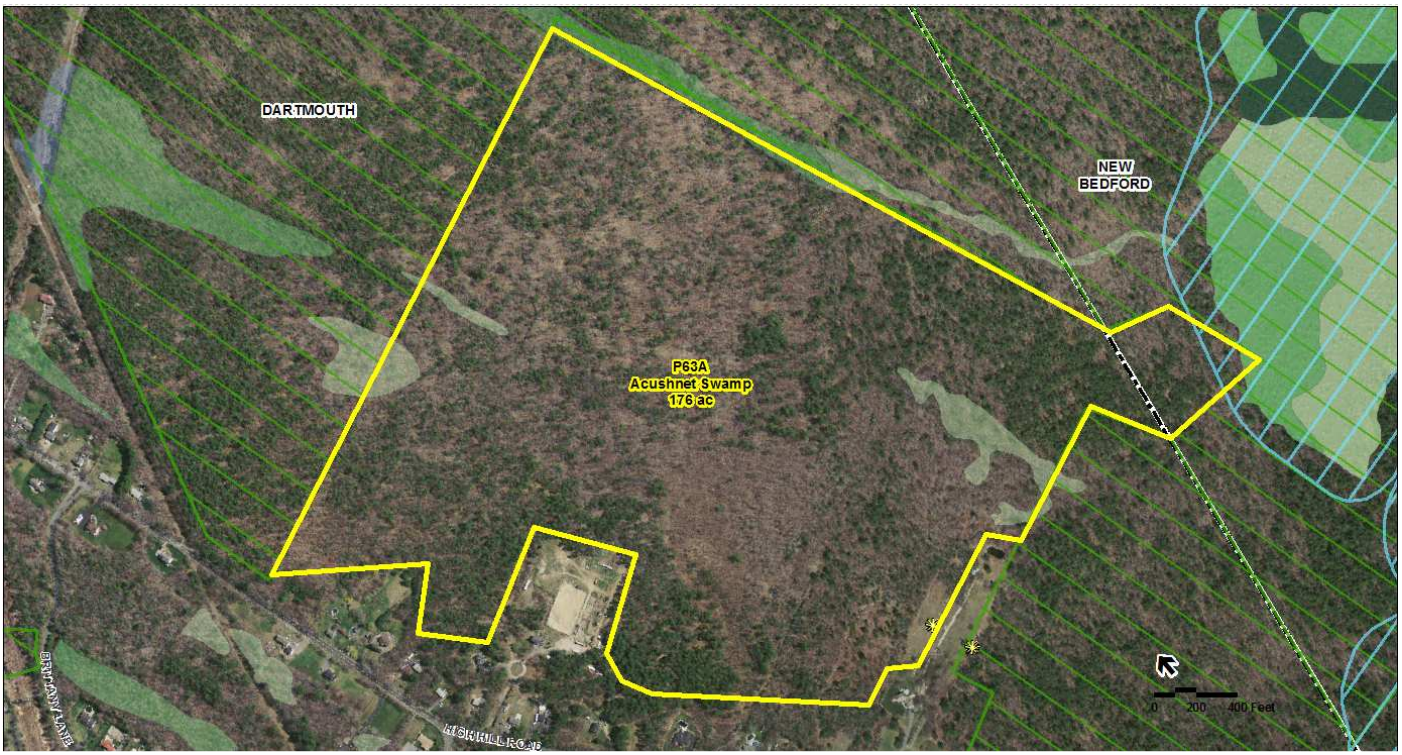


Figure 45. Area P63A, Acushnet Swamp. Scale = 1:5,000.

Figure 46. Area P63B, Acushnet Swamp. Scale = 1:5,000

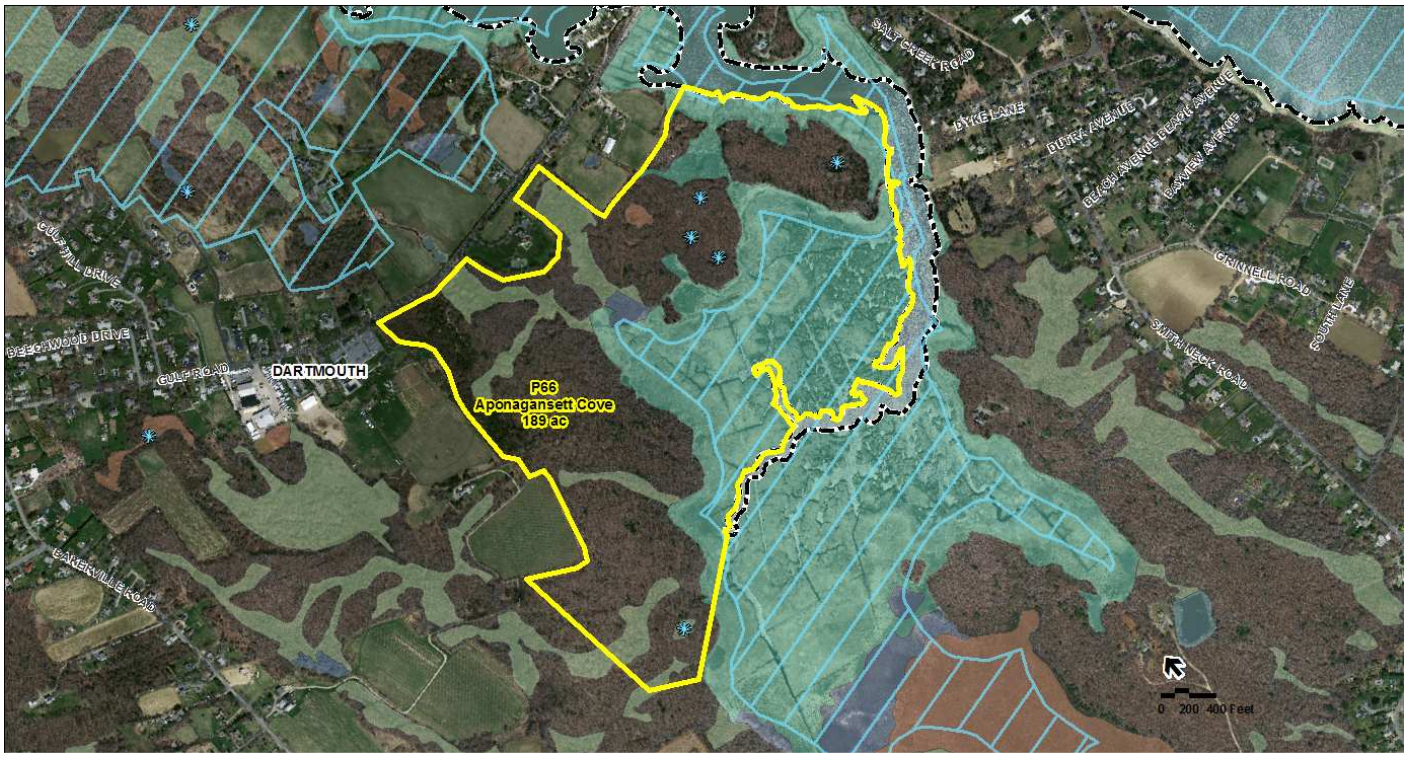


Figure 47. Area P66, Aponagansett Cove. Scale = 1:7,500.

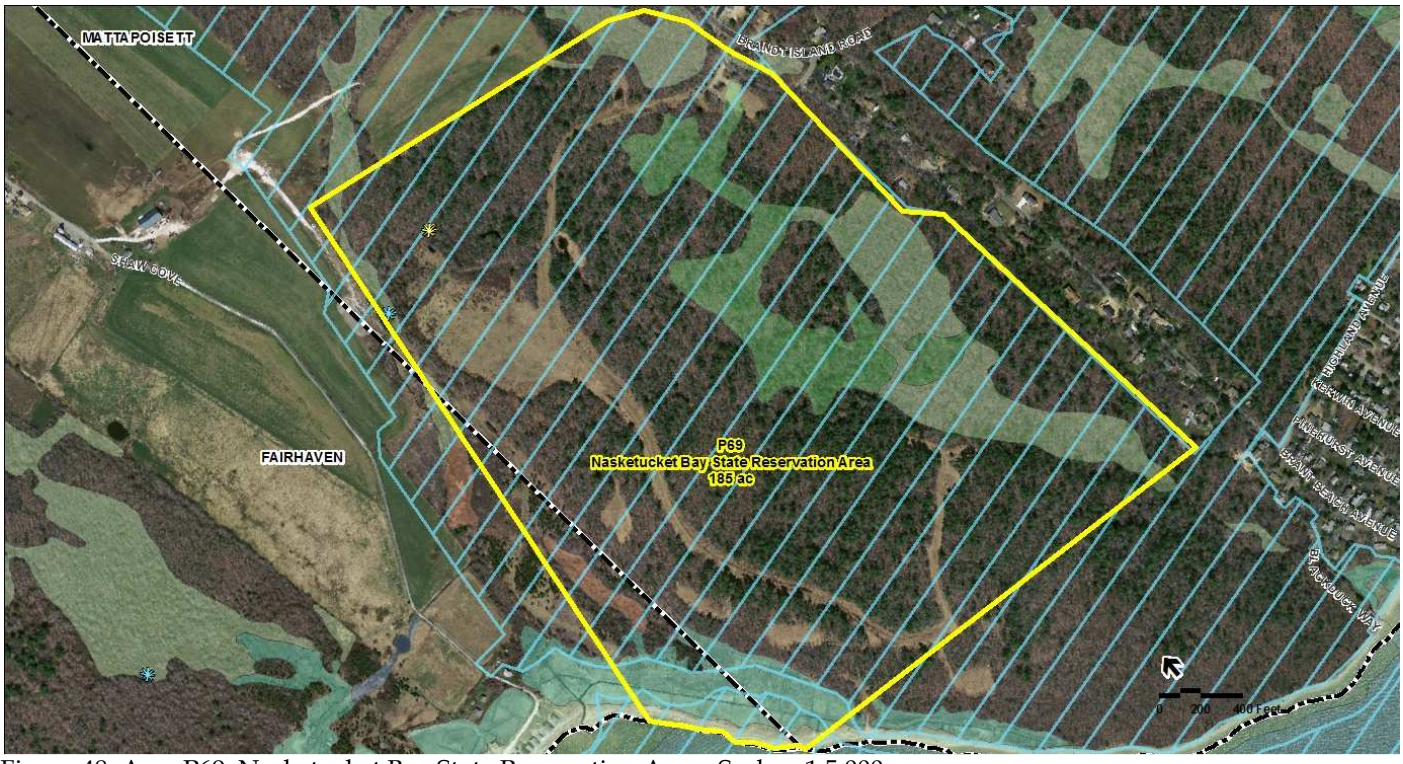


Figure 48. Area P69, Nasketucket Bay State Reservation Area. Scale = 1:5,000.